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The AUTOMOBILE

Flint—Second City of Industry

Produced 40,700 Cars in 1914 and Expects to Build 58,400 This Year—Accessories Important

By L. V. Spencer

MAKING an investigation of the position which Flint, Mich., occupies in the automobile industry, reminds one of the type of man, who, though he has accomplished great things and has gained a certain amount of fame in the world, is very quiet and unassuming and does no bragging about it. The stranger would never guess from the information gained from him that he was a prominent personage.

So it is with Flint. Though the city has grown in a few years until it now has a population of over 50,000, and is doing a big work for the automobile industry, it does it all in a quiet way, complacently crediting its growth to the automobile business and annually turning out more motor vehicles than any other city in the world except Detroit.

58,400 Cars for 1915

The estimated 1915 output of the five Flint motor vehicle factories now actively operating is to be 58,400 automobiles. It requires the services of one-fifth of the city's population to do the work of building this volume of automobiles, including the employees of the parts and accessory firms allied with the industry.

The output of cars for the previous season—that is, from the start of the production of 1914 models in 1913 until the end of the 1914 selling year,—was 40,700. Thus in one year, a jump of about 43.5 per cent. is expected if present manufacturing schedules are lived up to.

FLINT'S CONTRIBUTION TO THE AUTOMOBILE INDUSTRY

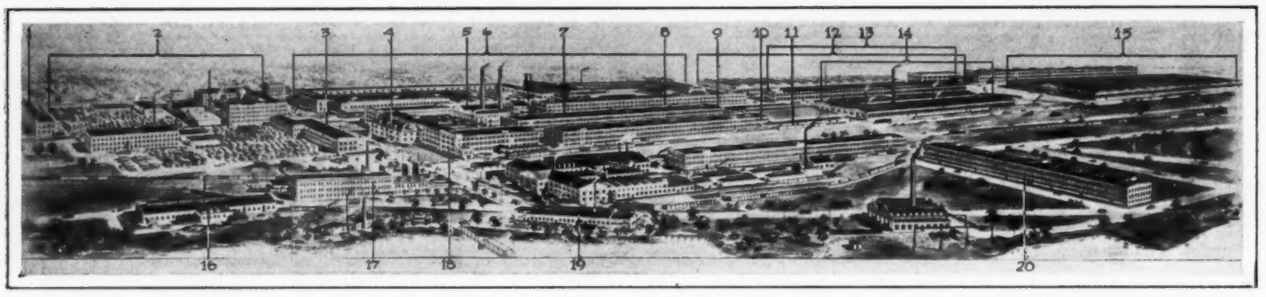
Name	Product	Incorporated
Armstrong Mfg. Co.	Springs	1897
Buick Motor Co.	Automobiles	1904
Champion Ignition Co.	Spark plugs	1908
Chevrolet Motor Co.	Automobiles	1911
Dort Motor Car Co.	Automobiles	1914
Durant-Dort Carriage Co.	Automobiles	1896
Flint Varnish Works.	Car varnishes	1909
Imperial Wheel Co.	Wheels	1912
Marvel Carbureter Co.	Carbureters	1908
Mason Motor Co.	Motors	1911
Michigan Motor Castings Co.	Castings	1907
Monroe Motor Co.	Automobiles	1914
W. A. Paterson Co.	Automobiles	1896
W. F. Stewart Co.	Bodies	1898
Walker-Weiss Axle Co.	Axles and hubs	1912
Weston-Mott Co.	Axles and hubs	1906
Total capitalization		$8,850,000

There are several factors responsible for this increase. The first is the stepping up of production by the Buick company, which will increase its output this year to 42,000 as compared with 33,000 vehicles last year. Chevrolet expects its production total to reach 10,000 for 1915 which is 3,000 cars more than last year. The Paterson company is figuring on a 900-car output, whereas it built practically 700 last season. Then the Dort Motor Car Co. with 2,000 cars planned, and the Monroe concern with a 3,500 schedule, both newcomers, complete the reasons for the prediction of a 43.5 per cent. total increase for the city. At the present time with each factory getting well under way, there seems to be no reason why the new high mark will not be reached.

The Backbone of the City

These automobile concerns, some idea of the size of which can be gained from the above figures and from additional statistics to be touched upon later, together with the parts and accessory plants, are the backbone of Flint today.

In the list of Flint institutions closely allied with the automobile industry will be recognized many names well known to the automobile



Bird's-eye view of the Buick plant, showing such factories as the following: 1, Spark plug factory; 2, body plant; 3, company garage; 4, office; 5, power house; 6, front and rear axle factory; 7; one of the assembly plants; 8, six-cylinder car assembly; 9, finished car storage; 10, assembly; 11, shipping; 12, sheet metal and radiator factory; 13, parts and service departments; 14, drop forgings; 15, motors; 16, paint; 17, springs; 18, machine; and 19 and 20, wheels

fraternity at large. They are: Weston-Mott Co.; Champion Ignition Co.; Imperial Wheel Co.; Marvel Carbureter Co.; Walker-Weiss Axle Co.; Mason Motor Co.; Michigan Motor Castings Co.; Flint Varnish Works; W. F. Stewart Co., and the Armstrong Mfg. Co. The total capitalization of these sixteen car and parts companies is $8,500,000.

From these facts it will be evident that Flint has attained an enviable position in the industry, and its growth is due to several causes. Originally a center for the making of carriages and wagons, which gained for it the title of the Vehicle City, it was but a natural step for many of the concerns at one time strong manufacturers of horse-drawn vehicles to turn to the making of automobiles and parts when they became a factor in the world's commerce. Some of the factories are still interested in both horse and automobile transportation.

Due to a frank tendency on the part of employers and employees alike to understand one another, Flint is strikingly free from labor troubles. It has pure water, plenty of room for respectable homes for the men in the factories and other features which would naturally attract the workman and the manufacturer.

Although Flint was a community earlier, settlement began in earnest in 1836, and the town was incorporated in 1855 with 2,000 people. It is therefore not a very old city, but in its comparatively short career has had lively development. Detroit, some 60 miles away, had been established since 1701 when Cadillac founded it as a trading post, becoming the capital of the Michigan territory in 1805.

Above—Chevrolet plant. The Chevrolet Motor Co. came to Flint from Detroit in 1912 and absorbed the Little Motor Car Co. From an output of 3,500 cars in 1912, the concern has laid plans for a 10,000 output this year. About 560 men are employed

Right—Factory of the W. A. Paterson Co. in Flint. This firm began making carriages in 1869 and entered the automobile field in 1909. It plans to turn out 900 cars for 1915. Working force is 350 men at capacity. Floor space of the plant is 102,000 square feet

Bottom right—Plant of the Monroe Motor Co., a new Flint concern having the same stockholders as the Chevrolet company. It is expected to manufacture 3,500 Monroe cars this year. The plant has an area of 160,000 square feet

Since Flint's industrial activity really began, the manufacture of vehicles has dominated. In 1886 W. C. Durant interested J. D. Dort in the organization that today is one of the largest vehicle-making concerns, operating under the title of the Durant-Dort Carriage Co. Even earlier than this, W. A. Paterson, now prominent in both the car and carriage fields, started in the carriage business. W. F. Stewart also appeared as a carriage body maker and woodworker in the early days.

It is a significant fact that names that are today prominent in the big automobile enterprises of this country run through the industrial history of Flint. Among these are W. C. Durant, C. W. Nash and J. D. Dort.

Beginnings of the Industry

The automobile history of Flint probably dates back to the time when Walter L. Marr, chief engineer of the Buick Motor Co. of today, designed the first Buick, the model B with its two-cylinder engine. Mr. Marr describes this first Buick, which he built some 16 years ago in Detroit, as a regular automobile with pneumatic tires. The beginning of the present Buick organization was on the fourth floor of a factory building in Detroit, where under the imposing name of the Buick Auto Vim and Power Co., marine engines were made under Mr. Marr's design and where this first car was constructed.

In 1904 W. C. Durant became interested in Marr's car, the firm was moved to Flint and the name changed to the Buick Motor Co. The first Buick under the present organization was built that year and before the year was out the then little plant had succeeded in making a total of thirty-seven cars. But the business grew so fast that the second year saw an output of 750 cars, and it was soon discovered that no plant in Flint was large enough to take care of the assembly of the cars. So they sent Marr to Jackson, Mich., to take charge of a plant which was available there. After 2 years in Jackson, this plant was given up, as by that time sufficient factory space had been built in Flint by the ever increasing concern.

The Great Buick Plant

Today the plants of the great Buick organization give employment to 5,000 or 6,000 men. The total number varies. For instance, on February 22 there were 5,329. At this time the number is greater than usual, due to the stepping-up of production.

There are now eighteen factory buildings in the Buick plant, and they cover over 56 acres. The total value of the machinery equipment comes to $2,417,580. Buick is

Upper—Factory of the Marvel Carbureter Co., 70 per cent. of whose output goes to the Buick company. During the last 5 months of 1914, and January, 1915, 35,000 carbureters were produced

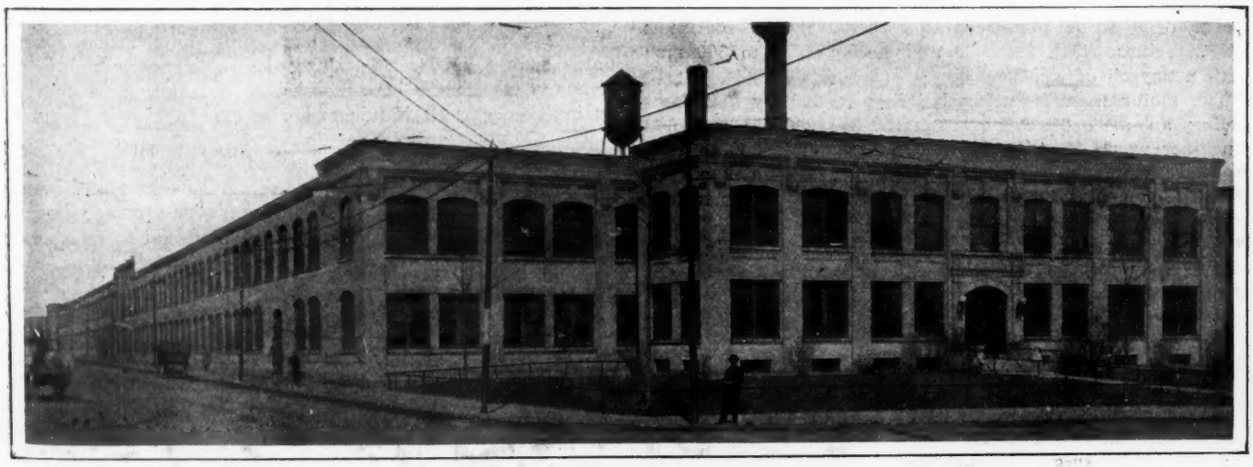
Lower—Mason Motor Co. plant. Started in 1911 with 150 men and built 1,500 motors the first year. Now employs 475 men and plans to manufacture 12,000 engines for 1915

now well along towards the final stretch in its year's schedule of 42,000 cars, some 35,000 having been produced to date. In all probability the production for 1916 will approximate 60,000 machines.

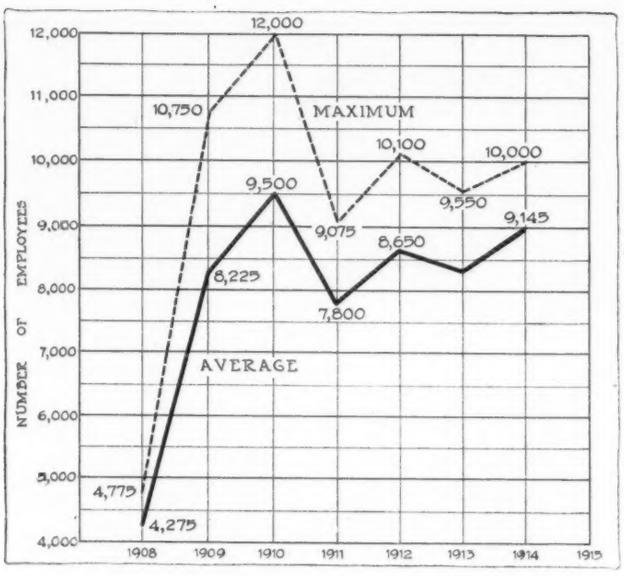
The Buick company of today is strictly a General Motors property, that organization owning all of the stock. It was in 1908 that the holding company, the General Motors, began acquiring its stock, although Buick may be regarded as the nucleus for the entire General Motors Co., Mr. Durant being instrumental in bringing about the transfer.

The bird's-eye view of the Buick plant appearing at the top of page 570 gives a fairly good idea of the extent of this tremendous industrial organization. To gain a conception of some of the buildings going to form this plant let us take a few of them up briefly:

The general office or administration building 104 by 56



Plant of the Weston-Mott Axle Co., which ranks second to Buick among the Flint concerns. It has 380,000 square feet of floor space, employs 1,490 men and makes 300 sets of front and rear axles per day



Showing rise in number of employees in Flint automobile and accessory plants since 1908. 1910 was the boom year

feet is three stories and basement in height and contains 17,472 square feet of floor space. The average number of employees in this building is from 200 to 225, the payroll approximating $8,750. All manufacturing and selling business is conducted here and the officers and department heads have their offices in this structure.

The general machine shop where complete transmissions are produced and containing a wood and metal pattern shop, experimental and engineering department and chemical and physical laboratories is 349 by 268 feet with floor space of 226,750 square feet. From 900 to 950 men are employed, the payroll averaging $34,149.

There are three final assembly buildings. One of these is three stories high, 74 by 750 feet and containing 168,600 square feet. Average number of men employed 350 to 400 payroll being nearly $15,000. Another is three stories, 74 by 800 feet with floor space of 177,600 square feet, employs 300 men with a payroll exceeding $16,000. The third assembly building is three stories, 74 by 758 feet with a floor space of 168,600 square feet.

The shipping department has a floorspace of 85,800 square feet being 211 by 308 feet. Average number of men employed is 165 to 200 and payroll averages nearly $6,000. This department has a record of loading 237 automobiles in a day.

The drop forge plant contains 85,400 square feet, has 215 machines worth $292,000 and employs 250 to 300 men with a payroll of $25,000.

The motor manufacturing building is 360 by 782 feeet giving an area of 278,460 square feet. There are 683 machines worth $804,130 in this building and 1300 to 1450 men are employed with a payroll of $74,290 per month. It has a capacity of 250 motors per day. The motor testing room contains 200 testing benches.

Service and sundry stock, body priming, top building and central factory storage departments are contained with the officers of the works engineer and electrical engineer in a building 74 by 782 feet with floorspace of 173,000 square feet.

Table Showing Growth of Flint's Assessed Valuation

1909	$14,418,960	1912	$24,569,228
1910	20,105,886	1913	33,902,697
1911	23,555,106	1914	40,000,000

The longest building in the group is 1,110 feet and contains 166,800 square feet. In this building are located the brass and aluminum foundry, the sheet metal and radiator factory and the enamelling department.

Motor casting department is 70 by 526 feet with two wings 80 by 170 feet, giving an available floorspace of over 65,000 square feet. Between 325 and 350 men are employed, the average payroll being $9,000.

The four story body-building plant has 121,800 square feet and the equipment consists of 140 special machines worth $88,000, and from 650 to 700 men are employed, the payroll being $40,000 per month. From 250 to 300 car and truck bodies are produced daily.

In addition to the buildings mentioned are power plants, company garage and other structures which go to make up the tremendous total.

It was probably the great success of the Buick that encouraged other business men to pin their faith to the automobile industry in Flint. Some of the vehicle and vehicle parts concerns which had long been established added departments for the building of automobile products as the demand grew and as they saw openings which they could fill.

Weston-Mott Co.'s Growth

The Weston-Mott Co., second largest of Flint's industries, and employing 1,490 men with an output at present of 300 to 320 sets of front and rear axles and hubs per day, was originally started in Utica, N. Y., in 1884, the early days of the bicycle. In 1905 the company was approached to establish a Michigan factory and as the limit of the Utica works had been reached, it was decided to leave it altogether and to build a modern factory in Flint. Accordingly, the concern was incorporated in 1906 under Michigan laws for $1,500,000, and in 1907 a factory of 60,000 square feet was completed. But this was soon outgrown, and expansion was in steps of size equal to the original buildings until 180,000 square feet had been acquired. Today, the Weston-Mott plants have a total floorspace of 380,000 square feet, and it is utilized to make one product—axles and hubs for motor cars. In 1909 about 25,000 sets were built, while some 75,000 sets will represent the factory this year. The concern has developed a highly specialized heat treating department and goes exhaustively into the engineering end of its business. Weston-Mott is now entirely a General Motors property, as is the Buick.

Champion Ignition Co. History

The Champion Ignition Co., one of the foremost in the country in the manufacture of spark plugs, was started in Flint in 1908. Previous to that time, Albert Champion, its founder, had been in the ignition business in Boston, managing the Albert Champion Co., importer and manufacturer. His first connection with spark plug importation really dates back to 1904. Mr. Champion, in forming the Flint company, associated himself with A. Schmidt, an authority on ignition, and B. deGuichard, also expert in such matters.

The Champion Ignition Co., now manufacturing more than 9,000 plugs per day, imported its porcelains at first, but in 1910 added a complete porcelain making plant, many of the processes of which are held secret, due to the extreme accuracy attainable by them and to the special form of clay resulting. With the advent of the high speed engine, Mr. Champion devised a new process for the making of plugs to care for metal expansion at the time of assembly, and thus do away with leakage which is a fault that this type of engine will soon bring to light. These new plugs were put on the market in May, 1914, and have met with success.

Armstrong Develops Springs

The J. B. Armstrong Mfg. Co., commenced operations in Flint in 1889. The company was, in reality, an offspring of the J. B. Armstrong Co., Ltd., of Guelph, Ont., which

concern has been engaged in the manufacture of carriages, carriage springs and axles for many years previous in the Canadian city. The company's product met with considerable favor in this country, and after the death of J. B. Armstrong, the company was incorporated under the Michigan laws by his son, R. T. Armstrong in 1897. The Armstrong company's original factory burned in the winter of 1899, and a new factory was erected in 1900. The present site, which is within a stone's throw of the mammoth Buick factories, was built a number of years later. At the start of the automobile business, the Armstrong concern gave much time and attention to developing springs suitable for automobiles, and in 1908 ceased the manufacture of carriage springs entirely. Realizing that the automobile trade demanded a much better spring that the carriage trade, the company added a heat-treating department to the original factory in 1911. The concern's sales at the present time total approximately $750,000 a year, and it gives employment to 175 men with an average weekly payroll of $3,500.

The Imperial Wheel Co. is another concern which started business in Flint to make products other than those required by the automobile. It commenced operations in 1904 in the building of vehicle wheels. In 1908, automobile wheel manufacture was added, and 3 years ago a new corporation bought this branch of the business, moved into a new plant fitted largely with new machinery, and since then capacity has been added until today 125,000 Imperial wheels for automobiles are made per year. The concern has southern connections for the supply of hickory wheel stock, no other wood being used. The present number of employes varies from 250 to 300.

Paterson Enters the Field

The W. A. Paterson Co. has long been a factor in the industrial growth of Flint. It was back in 1869 that W. A. Paterson first started carriage making, continuing this business vigorously until 1909 when, to keep abreast of the times, the making of automobiles was undertaken. That first year, only sixty-four Paterson cars were built, but the following year their manufacture was extended with the result that some 450 cars were made. The 1915 output will be close on to 900, it is said. The Paterson factory buildings have a total of 102,000 square feet of floor, and when working to capacity about 250 men are employed.

Michigan Motor Castings' Appears

The Michigan Motor Castings Co. was organized in 1907 as a foundry making gray iron castings for automobile parts. The plant has more than doubled in size since its beginning. While some extensions were made in 1908, it was during the following year that practically 180 feet was added to the foundry length, and also 83 by 180 feet for the core room and 82 by 185 feet for the cleaning department. The present floor area totals 61,220 square feet.

The concern was first organized by some Detroit men and the one important change in the organization was when the plant was sold to the General Motors Co. in 1909. In the early days of the business, 25 to 30 tons of metal were melted per day and that was considered a good output.

But it has been gradually increasing during the past 5 1-2 years, so that now the daily average is close to 55 tons. Up to 2 years ago the concern made castings for Cadillac, Northway, Buick and several others, but since 1913, Buick has taken the whole production.

Marvel Carbureter Plant

Flint is also the home of the Marvel Carbureter Co., which is now supplying all the carbureters for Buick, Oldsmobile and Oakland. It began business in 1908 and has an incorporated capital of $50,000. The output this year will be

Growth of Number of Employes in Flint's Automobile Industry

Year	Average	Maximum	Year	Average	Maximum
1908	4,275	4,775	1912	8,650	10,100
1909	8,225	10,750	1913	8,300	9,550
1910	9,500	12,000	1914	9,145	10,000
1911	7,800	9,075			

65,000 carbureters, of which the Buick allotment is 70 per cent. The concern operates with about 110 men.

Stewart, Body-Builder

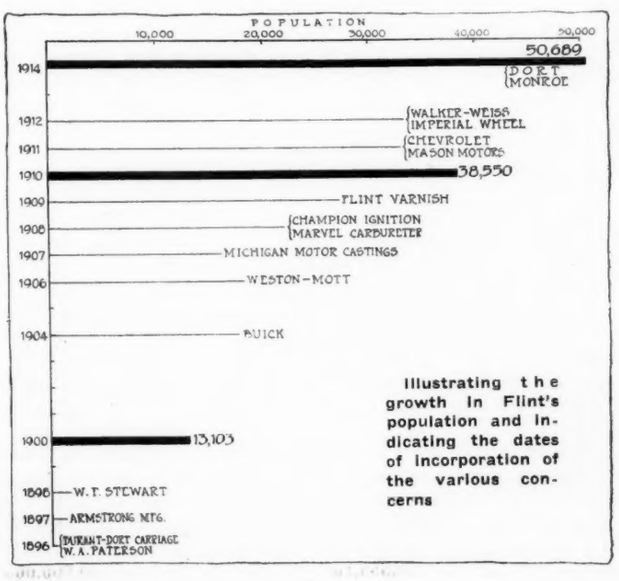
The W. F. Stewart Co. is one of Flint's old-timers which is just now getting into the automobile line strenuously. Organized in 1880 and incorporated for $100,000 in 1898, the concern has built only carriage bodies up to 1914, and during last year devoted only part of its attention to this field. Some 5,000 bodies were turned out, however. Now, with a force ranging from 375 to 400 men, Stewart bodies are to be built to the tune of 25,000 a year, carriage and wagon body business being abandoned. A large percentage of these will go to Buick, while Paterson and some outside manufacturers will take the rest.

The Value of Varnish

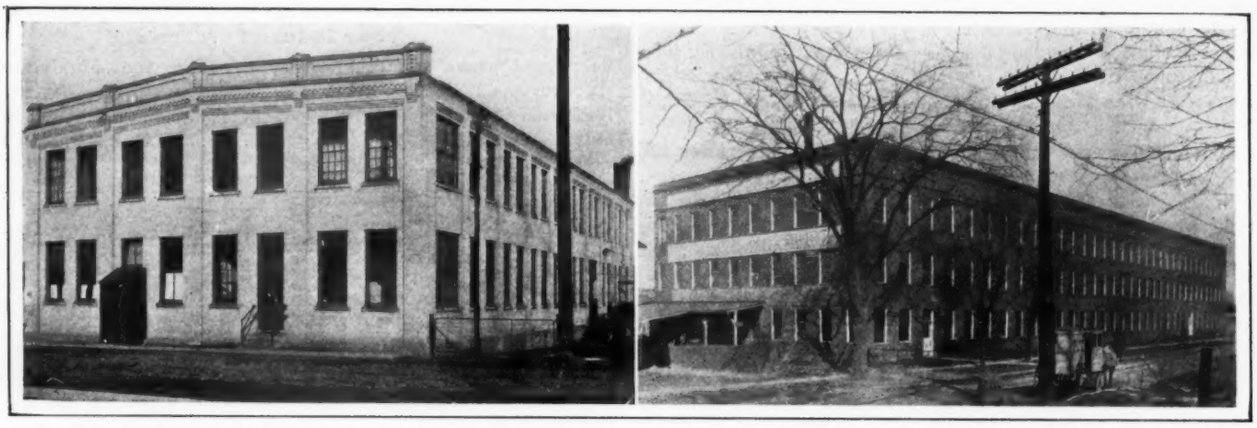
The making of varnish is not usually associated with the automobile industry as an accessory. Nevertheless, the Flint Varnish Works is a concern which specializes in varnishes and body colorings for the automobile trade. It takes up the car manufacturer's problem from the painter's standpoint, advising the number of coats to use, the kinds of finishing varnishes, and so on. The Flint Varnish Works began in a small way 6 years ago, doing business with the Buick company. That business extended until for several years now, the concern has been furnishing all the paints, enamels and varnishes used not only by Buick, but all the other General Motors properties as well, with the exception of Cadillac. There are 130 men in the factory and seventeen in the sales force. With a production last year considerably over the $1,000,000 mark, the plant is exceedingly busy. It measures 120 by 426 feet, is four stories high and is valued at $389,000.

12,000 Mason Motors for 1915

The Mason Motor Co., building motors exclusively, will this year build 12,000. It was incorporated in 1911 with



Illustrating the growth in Flint's population and indicating the dates of incorporation of the various concerns



Left—Champion Ignition Co. plant. Has been in business since 1904. The company makes the porcelains from raw clay. Right—Plant of the Imperial Wheel Co., which commenced in 1904 and began making automobile wheels in 1908. It employs 250 men and makes 125,000 wheels per year

$100,000 paid in, employed 150 men and built 1,500 motors that year. The second year, 3,500 engines went out from the plant. In 1914, this production was doubled. The Mason company now employs 472 men, and its product goes principally to Chevrolet, to the new Monroe company and to the Dart Motor Truck Co., Waterloo, Ia. Its buildings are valued at $65,000, and its equipment runs to $145,682.

Launching the Chevrolet

It was on October 30, 1911, that the Little Motor Car Co. was incorporated to do business in Flint with a capital stock of $1,200,000. Soon after that, on November 8, 1911, the Chevrolet Motor Co. was launched in Detroit with $2,500,000 capitalization. On September 1, 1912, about a year after the Little company was begun, the Chevrolet plant was moved to Flint and absorbed the Little, starting active manufacture in the same plants.

While in Detroit about a year, Chevrolet turned out some 500 cars, but the output took a jump to 3,500 the first year in Flint, stepping from that figure to 7,000 a year later. The plan for this year is to build 10,000. The plant gives employment to 560 men, and covers 8 3-4 acres, with a valuation of $667,000. Chevrolet also has plants in Tarrytown, N. Y., and New York City.

In 1912, F. J. Weiss, an old Flint Axle man; W. T. Walker, then assistant general manager of the Weston-Mott Co., and C. H. Bonbright, former sales manager of the Durant-Dort company, formed the Walker-Weiss Axle Co., whose output the first year, with sixty men, was from 5,000 to 6,000 sets of axles and hubs. Now, with 200 employed, the annual production is 20,000 sets in a plant that has doubled in value since the beginning.

Dort and Monroe the Latest

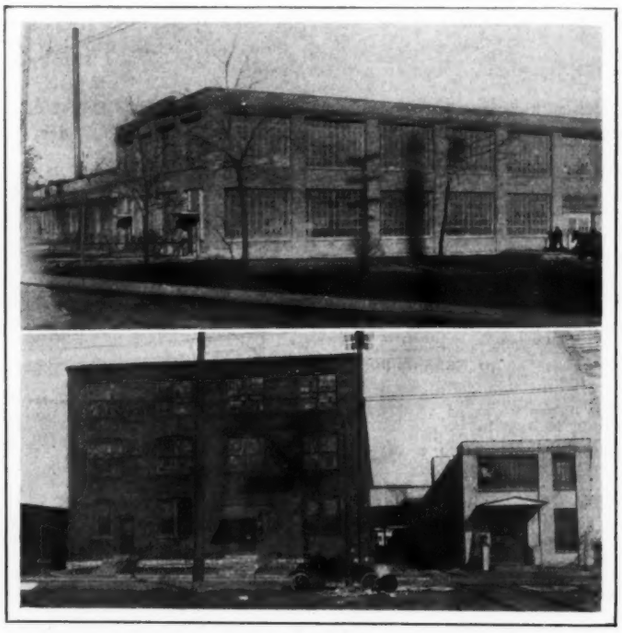
The first of this year, Flint received a new industry in the Dort Motor Car Co., which has a capitalization of $500,000. Its officers are all identified with the Durant-Dort Carriage Co., with which it is closely related. They are: J. D. Dort, president; D. M. Averill, vice-president and general manager; F. A. Aldrich, secretary and treasurer; J. D. Mansfield, sales manager; Etienne Planche, engineer. Regular production, which will be carried on in the Durant-Dort works, will start in April, and the schedule calls for 2,000 cars.

The other newcomer in Flint's growing list is the Monroe Motor Co., whose stockholders are the same as those of the Chevrolet, although the management is separate. R. F. Monroe is the president and general manager, W. C. Durant is vice-president, Curtis Hathaway is secretary, and A. G. Bishop, treasurer. The capitalization is $250,000, and the first year's contemplated output is 3,500 cars. The organization was effected on August 1, 1914, and now the concern is getting well under way. It is occupying the same plant that Chevrolet used for the building of its large six-cylinder car, and expects to have about 200 men on its payroll.

These little romances of business in tabloid form tell the story of the growth of Flint. Each industry is making its way in enviable fashion, helping to make Flint the busy industrial center that it is. And just as each has done its part in making Flint, so the growth of the automobile business is responsible for the development of every plant. This great transportation industry has pulled Flint out of the mud onto the boulevard of progress.

Environment and advantages had to be there before the industries could thrive, for, with equable taxes, good schools, plenty of fresh air on all sides, to attract the employes on the one hand, and cheap electric power, good transportation facilities and level-headed city administration to interest the manufacturer on the other, the town was destined to grow.

The organizations of employers and employes, which



Above—Walker-Weiss Axle Co. factory. Employs 200 men, has 45,660 square feet of floorspace and has increased output from 5,000 sets of front and rear axles to 20,000. Lower—Front of W. F. Stewart plant. Up to this year automobile bodies were a side issue and only 5,000 were built in 1914, but now they have been made the main production and 25,000 are planned

work together for the betterment of all, have done their part in making Flint a center which is strikingly free from labor troubles. The workingmen's organization is the Flint Vehicle Factories Mutual Benefit Assn. and that of the manufacturers is the Manufacturers' Assn. of Flint.

The vehicle workers' organization was formed that the men might have the advantage of benefit insurance at lowest possible cost. The factories encourage this work and help it along. Since its inception in 1901, the association has paid out $137,480.53 in sickness, accident and death benefits. Its dues are 10 cents a week for a benefit of $1 per day after the sickness or accident has disabled the man for 5 days, and benefits may be drawn for 18 weeks in any 1 year. A funeral benefit of $50 is also included. Dues of 15 cents give the member $1.50 per day under the same conditions, with $75 funeral benefit. But only employes whose pay amounts to $12 a week or more are eligible to this class.

Plan for Aiding Needy Members

Supplementary to the benefits thus derived, and of which 77 per cent. of Flint's factory workers take advantage, the manufacturers' association maintains a plan for aiding needy men who are members of the workers' association. This supplementary help of the manufacturers extends to those of their employes who are still sick and in need of financial assistance after they have received the benefits provided for by their policies in the vehicle workers' association. No fees or other expenses are incurred by the workman in getting this supplementary assistance, and its benefits are: For death or for total disability from sickness from causes covered by certificate of the Flint Vehicle Factories Mutual Benefit Assn. during a period which cannot exceed 104 weeks, $7, $8 or $9 per week, depending upon whether the beneficiary is a single man, or married man with no dependent children, married with one dependent child under 15 years, or married with two or more children under 15 years.

More than 2 years have passed since the supplementary plan was first put in operation, and over $16,000 has been spent to relieve suffering and want—sixty-eight of the plants' employes and their families having been aided.

Flint Appeals to the Workmen

Is it any wonder that Flint attracts intelligent workmen? They are given a chance to live, and are helped through their difficulties by the men who hire them. In return, they give the best service they can, and are a contented lot, on the whole. Such conditions are the foundations of successful manufacturing communities.

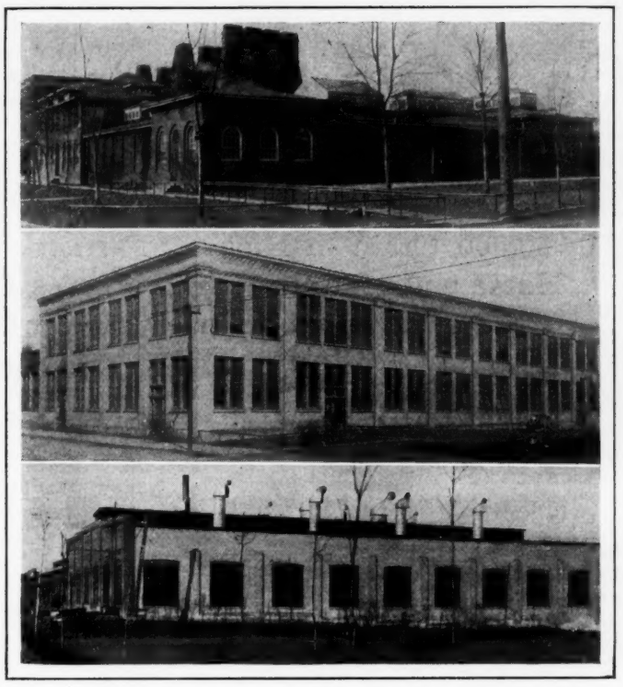
As another indication of Flint's growth, consider Uncle Sam's business in the city. From the time the automobile began to make itself known as a part of the city's prosperity, the postal receipts have been growing rapidly, as may be seen when it is shown that in 1903 the receipts were $35,714, but last year they had reached a figure nearly four times that amount, or $128,716.

A Valuation of $40,000,000

Flint was the victim of a slight over-growth in 1910, when somewhat of a boom condition was experienced. The factories expanded a bit too rapidly, as the tables and diagrams of total employed men will indicate. Following that year, business settled back to a sound basis, real estate values and other values which had been somewhat bloated got their bearings, and Flint started in on a steady and healthy growth. This will be brought out by an analysis of the various figures herewith. Flint cannot fall back now as it did then. Its foundations are now laid sanely and securely, and only the most unheard-of conditions could now cause a slump.

Flint today has an assessed valuation of about $40,000,000. It has two steam railroads for its shippers, and two electric traction lines. Its 1914 bank clearings were $23,985,113.76, through its five banks.

Located an equable distance from all commercial centers of the country, Flint is a modest little city of industrial opportunity.



Upper—Factory of Flint Varnish Works, which employs 150 men and whose product last year was valued at over $1,000,000

Middle—Michigan Motor Castings Co. plant, which has an area of 61,220 square feet, 350 employes and melts 55 tons of metal per day

Lower—J. N. Armstrong Mfg. Co. factory, which took up the automobile end of the spring business in 1908. Has 175 men and a $750,000 annual business. Makes motor truck springs

Testimonial Banquet Given Handley

INDIANAPOLIS, IND., March 27—A testimonial banquet to J. I. Handley, president of the Mutual Motors Co. and the Marion Motor Co., held at the Columbia club here, brought together about seventy-five of the most prominent men of the city to give Godspeed to the guest who is to leave the city to take up his work with the Mutual company at Jackson, Mich. C. A. Bookwalter, ex-mayor of Indianapolis, acted as toastmaster, introducing Lieutenant-Governer O'Neill the first speaker. The lieutenant-governor spoke of the tremendous resources of Indiana and their effect upon the automobile business of the city and state and praised the men in the industry for their good work under trying conditions.

Mr. Handley in his parting words to the men who have stood by him during his ups and downs, could not speak too highly of the bankers of the state who, he stated, did more for the automobile industry in Indianapolis than we believe. "The bankers lost money on the deals with many car concerns, but, despite the losses, which were heavy in many instances, they cheered us up and asked us not to quit but to come back for more because they were back of us. When the Marion company lost about $250,000 in the flood 2 years ago, the bankers stood by to see the company again on its feet."

INDIANAPOLIS, IND., March 27—W. D. Oakes, president of The Oakes Co., manufacturer of automobile accessories, has been elected general secretary of the Indianapolis Chamber of Commerce, of which F. I. Willis of the Hearsey-Willis Co. and a director of the Indianapolis Automobile Trade Assn. was recently elected president.

Car and Truck Sales in Southwest Gain 64.2% in 3 Months

$90,000,000 Grain in Bins of Farmers in Mississippi Valley Still Untouched—Horse and Mule Buying Increases Car and Truck Demand—$300,000 in Trucks in 3 Months—Crops in Fine Condition—Money Plentiful

KANSAS CITY, MO., March 27—The answer is coming every day to the standing question in the automobile industry as to just what bearing the enormous wheat crop of 1914 with its war prices will have on the sale of cars in the big grain states of the Mississippi valley. With the first 3 months of 1915 gone, it is possible to arrive at conclusions based on actual figures.

Alarmists have freely predicted that the farmers, to whom the bulk of the low and popular priced cars have been going, would quickly come to the end of their rope as the result of such a huge investment in a so-called luxury. They pointed to the fact that Kansas—always a weather vane in the grain states—had on January 1 of this year 50,467 automobiles, representing a total investment estimated at $40,363,200. This allows an average price of about $800 per car, which appears conservative when it is figured that of the 15,000 Fords in the state, many were bought at a higher price than prevails this year on the same make.

Returns on Car Investment

These men asserted that this money should have gone into wealth-producing investments, although the farmer gets 10 per cent. pleasure out of his car and 90 per cent. business where the average city man just reverses the proposition. However, what the automobile returns to the farmer on the investment is another story. The distribution of cars indicates that the farmer is buying cars more heavily this year than ever, instead of using his wheat money to pay debts brought on in the past, in so-called motor dissipation.

Business 64.2 Per Cent. Better

To get quickly to the point, the deliveries of low and medium priced cars in the southwest, as shown by the figures of factory branches and distributers in Kansas City, prove an increase of business the first 3 months of 1915 over the same period of 1914 of 64.2 per cent.

This takes into consideration that conditions in March this year were unusually bad for deliveries. Figures secured from the branches and agencies here, it may be mentioned, represent deliveries, not sales for future deliveries. Differences in territory and changes in territory, besides the closing of some agencies and the opening of others, make it difficult to make tabular comparisons. In many instances, too, it was impossible to secure the exact figures on deliveries unless the name of the manufacturer was omitted. In order, therefore, to secure figures without exaggeration, in some instances these names will be withheld. Among the cars represented in arriving at the percentage of increase of business are these:

¶ This is the second of a series of monthly industrial reviews on conditions in the southwestern territory embracing such states as Kansas, Missouri, Nebraska and Oklahoma, which comprise an important section of the Mississippi Valley, one of the greatest grain-producing regions in the world.

¶ Higher grain prices and an unprecedented demand for horses and mules for the European armies render this region particularly important as an automobile and motor truck market this spring.

¶ The author is one of the most widely recognized authorities in this territory, having watched the progress of these states for 25 years while in daily contact with their leading financial and industrial movements.

Ford—Figures on Kansas and western Missouri.
Overland—Kansas, western half of Missouri and northern Oklahoma.
Buick—Kansas, western tier three counties of Missouri.
Studebaker—Kansas, Oklahoma and western half of Missouri.
Maxwell—Kansas, Oklahoma, Arkansas, Louisiana, Texas, New Mexico, Wyoming and western half of Missouri.
Reo—Kansas, Oklahoma and western half of Missouri.
Chevrolet—Kansas, Oklahoma and western half of Missouri.
Chalmers—Thirty-five counties in Kansas and twenty-six in Missouri.
Hudson—Eastern half of Kansas and western half of Missouri.
Jackson—Kansas, Oklahoma and western half of Missouri.
Abbott-Detroit—Missouri, Kansas and northern half of Oklahoma.
Paige-Detroit—Kansas, Oklahoma and western half of Missouri.
Peerless—Kansas and western half of Missouri.
Marmon—Kansas, Oklahoma, western half of Missouri.
Packard—Kansas, Oklahoma and western half of Missouri.
Pierce-Arrow—Kansas, Oklahoma and western half of Missouri.
Locomobile—Kansas, Oklahoma, Texas and western half of Missouri.

This list gives a comprehensive idea of the cars and territory upon which the figures are based. Inasmuch as the low-priced cars and popular-priced cars represent farmer sales more largely and the higher-priced ones city deliveries, the Packard, Marmon, Locomobile, Pierce-Arrow and Peerless have been placed in one group and the lower-priced cars in another.

Fords Increase 98 Per Cent.

Ford deliveries in Kansas and western Missouri in the first 3 months of 1915 are given as 6,000 cars, which represents an increase of 98 per cent. The Ford cars in Kansas number almost three-tenths of all the cars in the state and the percentage will hold fairly well throughout the Mississippi valley.

Studebaker shows a delivery in January, February and March of 488 cars, 52 1-2 per cent. increase.

Overland, which has been a popular car in this region, gives some interesting figures, its increase of business in 3 months being 83 per cent.:

Deliveries	1914	1915
January	14	112
February	84	149
March	140	175
Total	238	436

Maxwell, with its great range of territory out of Kansas City, shows the delivery of 2,300 cars in 3 months of 1915, an increase of 500 per cent.

The deliveries of Reo and Chevrolet are combined in figures for 1914 and separated this year because of a change in dealers, but with a slight change in territory, the increase is estimated at 120 per cent.

Then taking in some of the smaller agencies and some of the others like Buick, which shows an increase of 50 per cent. with deliveries held up in 1 month, the average of increase in business is estimated at 64 per cent. The four largest companies show an increase of 68.7 per cent. While this is an average on percentage, it must be borne in mind that

one of these companies does a business in this district estimated at three-fourths of all cars sold. Taking this in view, a really closer estimate would be 74.2 per cent.

High-Priced Cars Sell Steadily

The Marmon, Locomobile, Packard, Peerless and Pierce-Arrow, placed in one group, show an increase in the first 3 months of 1915 of 66.1 per cent. over the same period of 1914. This, however, is not a fair average because of the 200 per cent. increase of business in the Kansas City branch of the Marmon company. This company in 1914 sold very few cars in this territory. However, last fall with an entire change of representatives at the branch, better results have been achieved. Only one of these cars shows no increase of business, while the other three, which are the largest sellers of the five high-priced cars mentioned, show an increase of 49 per cent., which represents a steady growth under normal conditions.

$300,000 in Trucks in 3 Months

The first 3 months of 1915 show a gain of 50 per cent. in the deliveries of trucks over the first 3 months of last year. The estimate placed on deliveries in Kansas and the western part of Missouri in the 3 winter months this year has been $300,000. Of this number, trucks worth $65,000 have been delivered in Kansas City.

The winter demand is a new thing here. Usually the truck dealers have settled back for a rest from December to March, but the inquiries commenced coming in this year in December and the sales of January, February and March are 50 per cent. greater than any previous year. One dealer has doubled his selling force and has sold forty-nine trucks, where the same period last year brought only nine sales. He has been in the business in this city 7 years and his conditions are exactly the same, except for the new salesroom.

A new demand is that for 1-ton trucks for jitney buses. However, the call from business concerns, hauling companies, has also increased and now the farmers are sending in many inquiries regarding trucks and are buying some for farm use.

Light Trucks for Jitney Work

The light truck seems destined to have a great use for inter-city jitney service. The motor bus which can haul passengers and some baggage and light freight is being asked for and it is predicted that regular routes will be established wherever the roads will permit in Missouri, Kansas, Oklahoma, Texas and Nebraska. Twenty-five trucks have been sold for this purpose in the last 6 weeks and they are growing in favor for city use instead of the rebuilt light pleasure cars.

Farmers Buying Trucks

The demand from the farmers for trucks is practically new. There are a few in use in Kansas and Missouri for hauling feed and for general use about the farm but quite a number are being used to replace driving teams. A 1-ton truck hauls the produce to town and hauls back feed, flour and supplies, serving as a semi-pleasure vehicle at the same time. The dealers are handling inquiries from the farm with a view of developing this sort of demand.

In accounting for the heavy sales which usher in 1915, Estel Scott, president of the Kansas City Motor Car Dealers' Assn., assigned several reasons:

One, of course, is the record-breaking crops of last year and the encouraging prospects for another big wheat crop this season. The high price of lead and zinc has made the mining district of Southwest Missouri and Southeast Kansas heavy buyers.

Also, the low price of gasoline and the high price of horse feed have helped the truck business. In addition to this a foot of snow that came the first of March, demonstrated the superiority of trucks over teams in a trying time.

Few Horses—More Trucks

But greatest of all the influences that is creating a demand for trucks and touring cars as well and just beginning to be felt, is the shortage in horses. A revolution is taking place in the truck business and a few months will see a condition that the motor truck producers have wanted but none dared hope for.

The British army has been buying liberally of horses in this section since Europe has been at war and the French have been fairly large purchasers too, but only the last few days have horse and mule buyers begun to realize what the demand is. A few days ago Thompson & Robinson, horse and mule dealers here, closed a contract with the French government for the immediate delivery of 26,000 head of horses. One day, March 20, forty-seven carloads left Kansas City for New Orleans. A contract is pending with the Belgian government for the delivery of 20,000 head. And if this does not mean sales of trucks and touring cars, listen then to the extremities to which the horse dealers are put in gathering horses to fill their orders in Kansas City, the second largest horse and mule market in the world.

When the foreign army officers first began buying horses and mules in this market, they segregated the animals and conditioned them with vaccination and other means. That has been abandoned in the rush. The animals are shipped immediately to New Orleans or Newport News. A fleet of ships is now waiting at Newport News to convey them.

And Missouri, Kansas, Oklahoma, Nebraska, Colorado and the Dakotas literally combed for horses for the British, are to be finecombed now to supply the French 26,000 head more. If the pending contract for 20,000 horses for the Belgian government goes through the demand will be still more urgent.

$12,000,000 for Horses and Mules

Approximately 60,000 horses and mules, valued at $12,000,000, have been purchased in the states mentioned since September 1 and have been marketed through Kansas City to the British. The desirable cavalry type were soon exhausted and the rule that all horses must be under 7 years of age was soon abandoned. Also the price has gone up from $25 to $35 a head since September.

For more than 2 months the British have been buying only artillery horses for which they pay around $225. The farmer gets from $160 to $185 for these animals. The type is the general utility farm horse, weighing from 1,200 to 1,400 pounds, up to 12 years in age, and a wire cut or a small blemish does not disqualify. The smooth-mouthed horse, whose teeth indicate he is over 9 years old, is going now if he has good short teeth.

The British are also buying mules for artillery purposes and are having to pay a little more for them than for the horses.

In getting the horses for the French contract, the efforts will be confined to the states already covered by buyers from Kansas City. The other districts of the country have been gone over as thoroughly as this and the scarcity of horses is general.

United States and Italy Buy Horses

The Italian government is now vieing with the United States government in purchasing young horses. Recently in Grand Island, Neb., the Italian buyers bought a lot of Spaghettis. These are horses 3 and 4 years old, and many of them unbroken. Branded western horses of this age, and so wild that they could not be handled except with a lariat, brought $100 to $110 apiece.

The United States army is also buying an exceptionally large number of young, unbroken horses true to type. These are being put on the government ranches at the remount stations. The action of this government is believed by horsemen to mean that the United States army fears a horse famine and is trying to stock up.

The scarcity of draft animals is beginning to be felt in the cities because of a movement to stock up in advance of higher prices. Teams suitable for brewery and packing house wagons are selling as high as $600.

Crop Conditions Excellent

The month of March has shown improvement in the condition of the winter wheat crop now in the ground. The great winter wheat crop states are Kansas, Nebraska, Oklahoma and Missouri. These states represent 44 per cent. of all the winter wheat acreage in the United States. These states show a percentage of 108 for area sown as compared with

1914. The spring wheat of Nebraska and the Dakotas, of course, will not be sown until next month, but these states, like the southwest winter wheat states, have had great supplies of moisture in the ground this summer. The winter wheat states show an average condition of 85 per cent. last December by the Department of Agriculture reports. It is believed the forthcoming report will show a condition above 90 per cent., which is exceptional.

Only the extreme western counties of Kansas have failed to show a decided improvement in the condition of the crop that will buy automobiles in the fall of 1915 and the spring of 1916. As a rule the March winds expose the roots of the wheat and much damage results, but March this year has been almost without wind and no damage has resulted.

Very little of the 1914 winter wheat crop, which has been in farmer's bins last month has been moved in March owing to the condition of the roads. The writer estimated in THE AUTOMOBILE last month the winter wheat still held on the farms —and representing surplus available for automobile purchase—to be less than 20 per cent. of the crop. The Department of Agriculture bulletin, published March 4, gave its estimate at 17 per cent. So apparently the heavy purchases for the winter months of automobiles has not yet touched this surplus wheat of which there is nearly $90,000,000 worth still in the farm bins of the southwest.

Corn Has a Good Start

While the wet March will make the starting of farm work late, it will leave the ground full of moisture in the corn belt, which means great things to the farmer. The cattle quarantines in the west, while disquieting, have not demoralized the stock in any sense of the word. The government is taking vigorous steps to stamp out the foot and mouth disease. It is bending every energy to keep the disease off the big ranges because it is feared that if it gets started there it will travel on account of the absence of fences. The action of the western states in uniting with the federal government to pay for all stock killed as a result of finding the disease has caused every farmer to be on the alert to detect the first symptoms so the government can act. The payment by states for slain cattle, too, has made the farmer continue to handle cattle that he would not otherwise risk doing. This situation need not cause any alarm about general prosperity in the west.

Banks Full of Money

The money market of the grain states shows money easy for strictly commercial purposes. The bank deposits in Kansas City, as representative of the western states, showed an increase in the last bank statements, March 4, to $122,000,000 against $110,000,000 last December and $106,000,000 a year ago. The business man with products in course of marketing, and this applies to the farmer, has little difficulty in getting money, though there is little cash for building enterprises, etc. However, farm loans and real estate loan money is plentiful and there is greater demand for this paper than there is for the loans. The banks March 4 showed loans $1,000,000 less than last December. Since March 4 there has been a slight decrease in deposits, due to the farmer's inability to market his products over muddy roads.

Critical Days for Jitney

These are critical days for the jitney. In Kansas City, the city Democratic administration, closely tied to the Metropolitan street railway company, is trying to put through the city council an ordinance with these jitney-killing provisions:

A $5,000 to $10,000 bond; a 15-minute schedule; $5 to $10 a month according to the number of passengers; must get special permission from the park board to cross or use boulevards; must get special permission from the board of public works to use streets.

The whole, of course, is prohibitive and warranted to put the jitney out of business. The proposed ordinance is now before the council committee. At the first meeting of the committee there were 300 jitney sympathizers present and labor was there to protest the methods being taken to deliver the town to the street railway company. The motor dealers and the jitney men each had an attorney. Apparently the ordinance will have much modification in the council, but to what extent remains to be seen. The council is divided in two Democratic factions, but each is tarred with the Metropolitan stick. There are about 300 jitney cars operating here, but the ordinance fathered by the city counselor has frightened would-be jitneyists so that the number is not increasing very rapidly at this time. At the last meeting of the council committee, the members of the committee favored a less drastic ordinance.

Automobile Trade Increasing in Texas

AUSTIN, TEX., March 26—From a trade standpoint the automobile situation in Texas at this time is highly satisfactory. This condition is particularly true in the western part of the state where the demand for automobiles is larger than ever before known. Dealers in that region are having some trouble getting their orders for cars filled promptly. In the wheat-growing territory around Amarillo an extraordinary large number of orders have been placed recently. In the territory lying immediately south of the Panhandle, where milo maize and Kaffir corn are the principal crops, an unusually large automobile trade is reported.

There is some little quantity of cotton still in the hands of the farmers of Central, North and South Texas, but the movement of the staple to market has been heavy and steady since last December. The money derived from this source is now in general circulation and while the aggregate sum is by no means as large as it would have been had normal prices prevailed, it is sufficient to keep all lines of business moving to a prosperous degree. In the strictly cotton growing region there has been a large falling off in sales of cars to farmers but the prospects as to this class of trade are brightening daily. Prospects are promising for another good crop season and this adds to the prevailing optimism.

The demand for motor trucks and delivery cars is constantly increasing in the cities and towns and there promises to be a far greater number of sales of these vehicles during the current year than during any previous yearly period in the history of the industry in Texas.

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1 and 2-Ton Trucks Popular in England

NEW YORK CITY, March 29—That there is a good market in England now for 1- and 2-ton trucks for regular commercial use, is certain, according to a statement recently made by P. D. Saylor, managing director of the Goodyear Tyre & Rubber Co. of Great Britain, the Goodyear company's European organization. Mr. Saylor, who is now in Akron, O., states that most of the English trucks go to the army and business organizations have a hard time supplying themselves. He also says that the American truck manufacturers should have the best possible representation, or, better still, send their own representatives to handle the business. No pleasure cars have been commandeered by the government, however, despite the demand for any vehicles in truck form.

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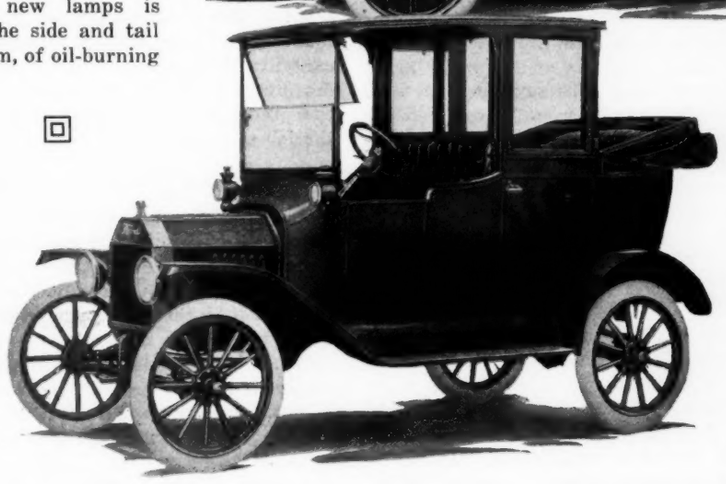
LONDON, ENGLAND, March 24—The American motor ambulance corps operating with the French army has been transferred to the British army. The corps is to be enlarged.

Electric Headlights on New Fords

Pressed Steel Dash, Stronger Windshield, Louvres in Hood—New Side and Tail Lamps and Curved Rear Mudguards—Flywheel Magneto Is Enlarged for Lighting

DETROIT, MICH., March 29—Although the Ford Motor Co. has been supplying its new type of roadster, touring car and town car models for a little over a month, no announcement of the new designs has been given out until today. The shipment of these is now quite general to dealers and branches. Changes are principally in the body and appearance, the model T chassis adhering to standard Ford practice with the exception that the flywheel magneto has been somewhat enlarged to take care of the lighting of the electric headlamps, which are now standard equipment. Lighting of the new lamps is through a dash switch. The side and tail lamps are also of a new form, of oil-burning variety. They are more compact and conform better to the body lines.



Switches Under Cowl

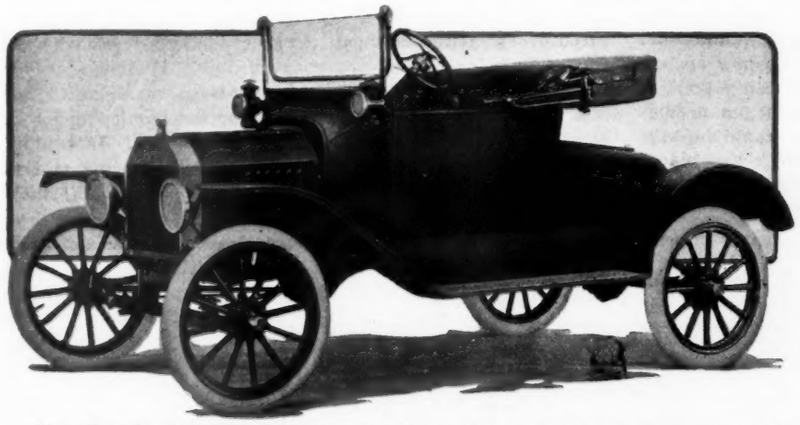
The most noticeable change is the incorporation of the pressed steel dash in place of the formerly used straight wood type. The switches and other apparatus are placed back under this cowl, on the dash. Other improvements are in the windshield, which is a stronger and more compact type to fit the cowl, and louvres in the hood to give better ventilation to the engine.

Another noticeable change is in the rear mudguards, which now conform to the curve of the wheels rather than running straight back horizontally from the point of greatest height. These guards are made of heavier metal than the former ones, and their form admits of better bracing against rattle or vibration than with the other type.

The Ford flywheel magneto generates the ignition current, and by increasing the size of its windings, the taking on of the headlight current was made permissible. Heretofore, with the smaller generator, the Ford company did not favor this lighting system, though a number of older models have been so equipped by their owners with apparatus purchased from outside firms. The generated current is alternating, and the lamps are of standard type with focusing attachment and Ediswan sockets.

There is no change in the prices of either model, the roadster listing at $440, the touring car at $490, and the town car at $690.

The town car has been adapted to the new lines of the pressed steel dash and curved rear mudguards. Both this model and the roadster have all improvements found in the touring car.



New Ford touring car, town car and roadster, showing improved design, comprising pressed steel dash, stronger and more compact windshield construction which fits the cowl and louvres in the hood to give better ventilation to the engine. Note the rear mudguards which now conform to the curve of the wheels instead of running straight back from the top. These mudguards are made of heavier metal than those formerly used and are less susceptible to rattle or vibration. In all models the flywheel magneto has been enlarged to take care of lighting the electric headlamps

Eisemann's Train-Dispatcher System

Signal Shows When Tracks Are Clear and Marks Progress of Production Train from Start to Termination—Factory Expanded and New System Installed While Three Shifts a Day Are Working

By J. Edward Schipper

A ROOM is not complete until all the furniture is placed in it. Furnishing the room is like the final assembly of a magneto. Before the furniture can be put in the room it must be made. The manufacture of the furniture corresponds to the manufacture of the smaller parts in the magneto. Again, the fittings for the furniture, such as the castors, the upholstery, the tacks and fastenings, must themselves be manufactured. These correspond to the small screw machine parts on the magneto which must be manufactured before even the smaller groups can be made. Thus it is an alternate process of manufacture and assembly until finally the main groups are made and the furniture is put into the room or the various parts of the magneto joined together to form the finished product.

Production in groups, where each little group is completed and then moved on to form a member of the next larger group, and that in turn goes through the same process until at last the joining together of a few units completes a finished article, is the method that must be followed in the manufacture of an article involving a multitude of small and distinct parts. Such an article is the magneto, and to meet the intricate problem of the inter-weaving of a large number of separate sequences such as is found in its manufacture a well organized system must be utilized in order to avoid chaos.

Three System Requirements

Through an overwhelming number of orders necessitating a new addition to the factory and the necessity for installing a complete new system of production, the Eisemann Magneto Co. has found itself confronted with three simultaneous problems. One—The factory had to expand into the new addition. Two—Production must not be interrupted. Three—A complete new routing and recording system installed.

The plant is working night and day. Three shifts of men and women divide the 24 hours of each week day into equal periods of steady productive work, and yet the new system has been installed, the new factory space is being utilized and production has been not only uninterrupted, but men in various departments have been able to make rapid inroads on work in which they were several weeks behind owing to the deluge of output problems in relatively small space.

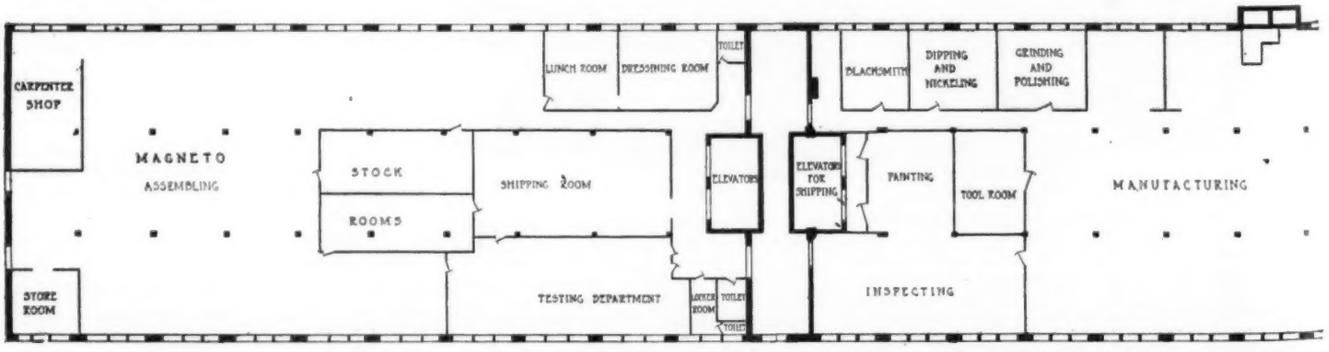
A simple system installed by the Associated Efficiency Engineers has been the oil that stilled the troubled waters of hurried production, and the smoothness of operation which now characterizes the course of an order from the time it enters the offices of the plant until it enters the elevators of the Bush Terminal Co. forms a vivid comparison to the chaotic condition which could exist in the manufacture of several hundred magnetos per day, not to mention the coils and switches and other electrical products turned out by this concern under other conditions.

Orders are carried through on the train-dispatching system. The dispatcher at his desk takes care not to fill the tracks with too many trains of orders. He knows when a train is late, he knows when it is due but has become lost upon some siding along the route, and he knows the cost of carrying the train through from its starting point to its destination. This is done by a two-fold form system in which the production or manufacturing order is first written, and the job order follows.

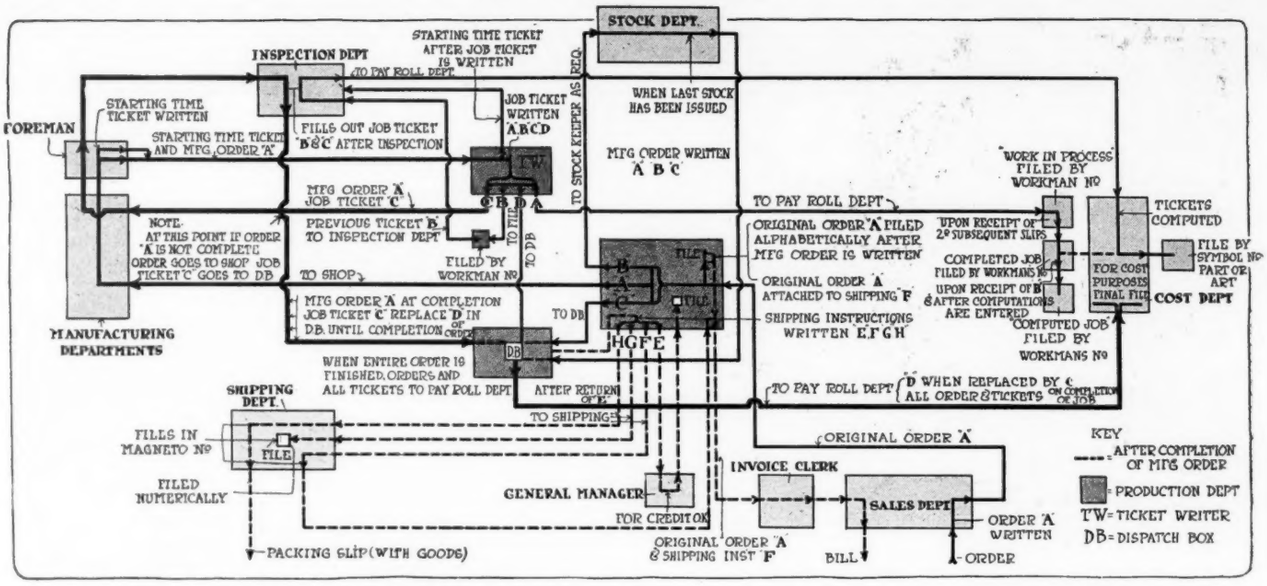
Production Department Is Biggest Factor

The biggest factor in the situation is the production department. When an order comes in for a number of magnetos it has its starting point in the sales department which secures the order. From this point the order is forwarded to the production department, where it enters the hands of the clerk, who starts the entire system in operation. The form first made out is threefold, and for simplicity this triplicate document may be named manufacturing orders A, B and C. A goes to the shop and stays with the goods until they are delivered to their final destination. This identifies the work, and to prevent the loss of the order or its misplacement the form A is placed in a celluloid envelope, and in company with the blueprint of the work and a standard operation sheet provides the workman on that particular job with all necessary information.

B goes to the stockkeeper and forms a requisition upon him for the materials and the tools for the particular job in hand. This is one of the confusion-preventers. Instead of a number of men loitering around the tool department desk waiting for dilatory clerks in this department to fill their



Floor plan of the Eisemann factory which shows the location of the various departments, and


STOCK DEPT.
INSPECTION DEPT
STARTING TIME TICKET AFTER JOB TICKET IS WRITTEN
TO PAY ROLL DEPT.
FOREMAN
STARTING TIME TICKET WRITTEN
STARTING TIME TICKET AND MFG. ORDER 'A'
FILLS OUT JOB TICKET 'B & C' AFTER INSPECTION
JOB TICKET WRITTEN 'ABCD'
TO STOCK KEEPER AS REQ.
WHEN LAST STOCK HAS BEEN ISSUED
MFG ORDER WRITTEN 'A B C'
MFG ORDER 'A' JOB TICKET 'C'
NOTE. AT THIS POINT IF ORDER 'A' IS NOT COMPLETE ORDER GOES TO SHOP JOB TICKET 'C' GOES TO DB
PREVIOUS TICKET 'B' TO INSPECTION DEPT
FILED BY WORKMAN Nº
TO SHOP
MFG ORDER 'A' AT COMPLETION JOB TICKET 'C' REPLACE 'D' IN D.B. UNTIL COMPLETION OF ORDER
TO DB
MANUFACTURING DEPARTMENTS
WHEN ENTIRE ORDER IS FINISHED, ORDERS AND ALL TICKETS TO PAY ROLL DEPT
AFTER RETURN OF 'E'
TO PAY ROLL DEPT
ORIGINAL ORDER 'A' FILED ALPHABETICALLY AFTER MFG ORDER IS WRITTEN
ORIGINAL ORDER 'A' ATTACHED TO SHIPPING 'F'
SHIPPING INSTRUCTIONS WRITTEN 'E F G H'
'D' WHEN REPLACED BY 'C' ALL ORDER & TICKETS ON COMPLETION OF JOB
WORK IN PROCESS FILED BY WORKMAN Nº
TICKETS COMPUTED
UPON RECEIPT OF 2ª SUBSEQUENT SLIPS
COMPLETED JOB FILED BY WORKMAN'S Nº
UPON RECEIPT OF 'B' & AFTER COMPUTATIONS ARE ENTERED
COMPUTED JOB FILED BY WORKMAN'S Nº
FILE BY SYMBOL Nº PART OR ART
FOR COST PURPOSES FINAL FILE
COST DEPT
SHIPPING DEPT.
FILLS IN MAGNETO Nº
FILE
FILED NUMERICALLY
TO SHIPPING
ORIGINAL ORDER 'A'
INVOICE CLERK
GENERAL MANAGER
FOR CREDIT OK
SALES DEPT
ORDER 'A' WRITTEN
ORIGINAL ORDER 'A' & SHIPPING INST 'F'
BILL
ORDER
PACKING SLIP (WITH GOODS)
KEY
AFTER COMPLETION OF MFG ORDER
PRODUCTION DEPT
TW = TICKET WRITER
DB = DISPATCH BOX

The above chart shows the plan of the tracks which guide the wheels of progress of work in the Eisemann factory. This is the key to the form system

needs, the order itself is a requisition, and IT IS UP TO THE HEAD OF THE STOCKROOM TO SUPPLY THE MATERIAL FOR THE JOB.

C is the follow-up copy. It is an exact duplicate of A except that it is printed on heavy manila card, and on its reverse side, as shown on page 586, there is a complete form in which cost-keeping records may afterwards be conveniently kept. This is the keynote card of the system in several ways, because it is the form by which the dispatcher keeps tabs on the work. Across the top of the card are printed the numbers 1 to 31, the days of the month. These cards are filed in the dispatch box along with all the other corresponding cards of different jobs, in their proper classifications.

As soon as the order is entered in the dispatch box a dark red signal is clipped to the number corresponding to the date. When the dispatcher's signals tell him that the track is clear and he has forwarded the order through to the foreman of the department which will handle the work he will receive from that foreman a starting time slip which signifies at once that the work is under way. At this moment the dark red signal is replaced by a black signal, indicating that the work has been started on that date.

When the dispatcher is advised by the receipt of a job ticket, hereinafter described, that the work is completed, and before it returns from the factory, another colored signal is clipped to the date that the work is finished. When the work is shipped from the factory the card has finished its useful career and passes to the cost department, where it is filed, together with the cards A and B. When the card C is filled out on the reverse side the information is entirely complete.

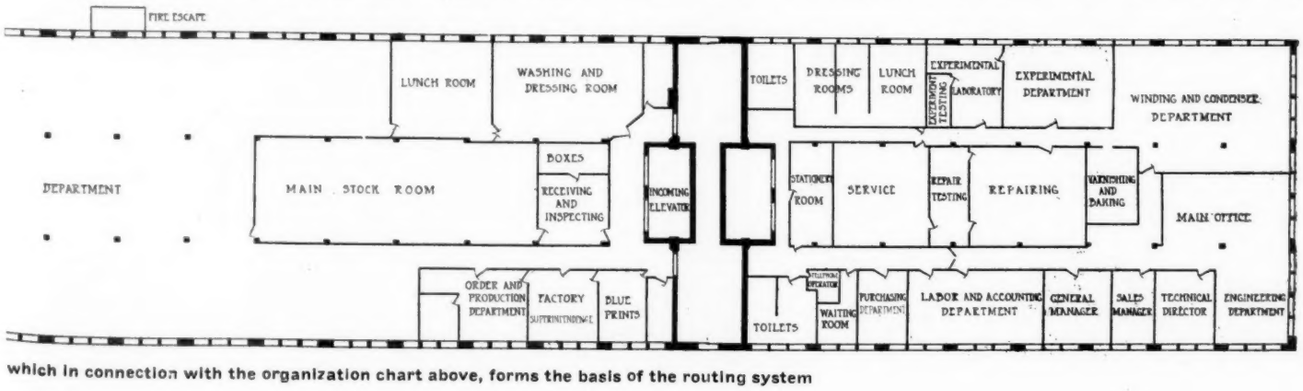
Should the order be specified for a certain date the dispatcher will attach a white signal a few days before the date that the order has to be shipped. In this way delinquent deliveries will be avoided.

Dispatch Box Is Heart of System

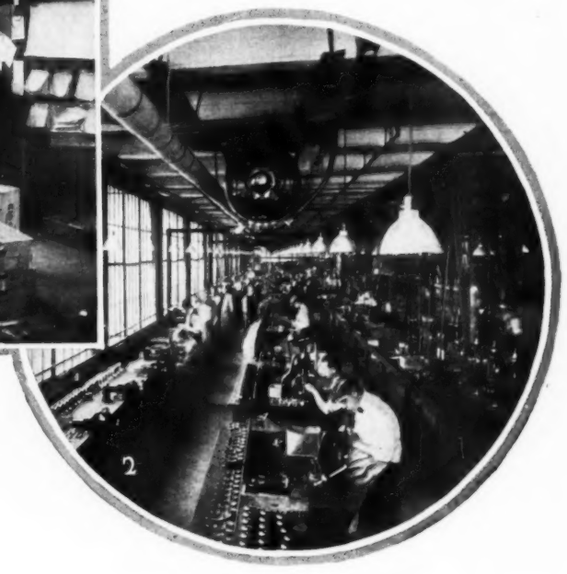
THE DISPATCH BOX IS THE HEART OF THE SYSTEM. The dispatcher can tell at a glance by the colored signals just how every bit of work stands. When an order is stationary for a time he knows immediately that there must be some reason for its not moving forward, and it is up to him to find out why. Only when a green indicator is displayed showing that the work is held up for legitimate cause should he tolerate a lack of advancement of the signals as they progress along the row from number to number.

The actual process of manufacture is set in motion by the manufacturing orders described and the starting-time slip. This starting-time slip is the only form that must be made out by the foreman. The workman himself need not have a pencil and need not know how to write. On this starting-time slip the foreman enters the number of the workman to do the job, the number of the machine that it is to be done upon, the starting time of the job, whether the work is to be paid piecework or day work, and the numbers of the operations to be performed, as ascertained from the accompanying standard operation sheet.

In the production department is the ticket writer who, when he receives word by means of the starting time slip



which in connection with the organization chart above, forms the basis of the routing system



Progressive Steps in the Manu Under the Train-

1—Receiving department and inspection of raw stock

2—Small parts manufacture—note good light for detail work

3—Special machinery in the manufacturing department for heavier parts

4—Girls at work in the airy and light armature and winding department

that a job has been started, will write in quadruplicate the tickets which may be called AA, BB, CC and DD. Each set of four of these tickets will be numbered serially and will provide for the date, the workman's number, the part number, the number of hours he works, operation numbers, starting time, method of paying, rate of pay, finishing time, inspector's count, quantity accepted, quantity rejected, cause of rejection, the account to which the job is charged, lost time, overtime and the amount paid.

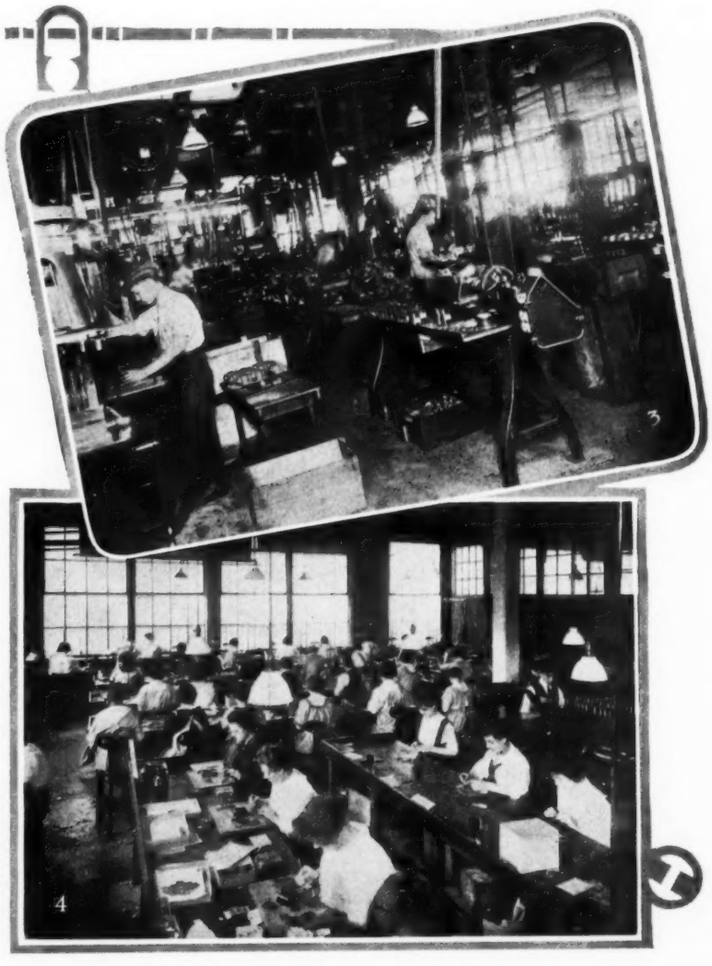
When these four job tickets are made out the starting-time slip is placed in an envelope and sent to the chief inspector in order that he may know what work is in progress and assign his floating inspectors thereto. These floating inspectors not only examine the set up of tools but prevent wastage in material and labor by seeing that the workman properly starts the job. The destinations of the four job tickets after they have been filled out as far as possible by the ticket writer at the beginning of the job are as follows:

Envelope Picked Up By Messenger

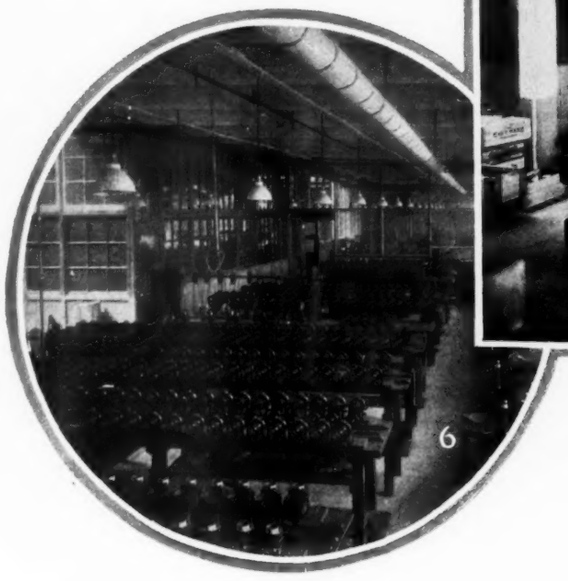
AA goes to the payroll department to be filed in the Work in Process File. BB is filed by the ticket writer in a card index file by workman's number, thus forming a complete record of what each workman has done with his time. CC is inserted in the celluloid envelope, which is picked up by the semi-hourly messenger and returned to the foreman with the order. DD is delivered to the dispatcher and filed in his follow-up file with manufacturing orders C.

It will thus be seen that when card BB is filled by the ticket writer it will mean that the job previous which that particular workman has been engaged upon is finished, and this can be taken from the file and sent to the inspection department, thus notifying this department that this particular work is done and must be inspected at once.

The messenger service which has been briefly men-



facture of Eisemann Magnetos Dispatcher System



5—Inspection department—note use of standard stock boxes

6—Final assembly on stands specially prepared for magneto bases

7—Final testing which shows whether or not magneto is fit for arduous service

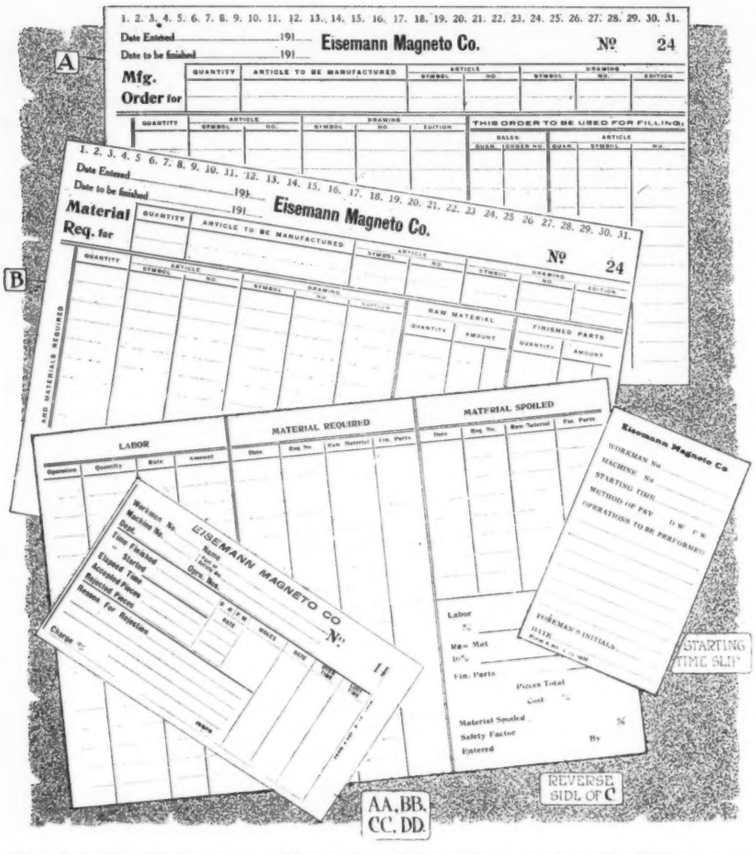
8—Shipping department where the goods are delivered to the Bush Terminal

tioned consists of a boy who makes the entire rounds of the shop every 30 minutes for both collection and delivery of the forms, etc., which go to make up this system. He is the dispatcher's telegraph service which keeps the entire plant in operation. Each foreman is provided with a rack containing three holders, one of which is used for incoming envelopes; second, for outgoing envelopes, and the third, for extra or empty envelopes. Each foreman in addition is supplied with pads of starting-time slips to start operations on any job in his own particular department. When the messenger boy makes his rounds he takes the envelope from the outgoing, deposits any envelopes he may have for that department in the incoming, and then proceeds to the next department on a preordained route, from which he is not permitted to depart.

Job Ticket Returned

After a job is finished and inspected the celluloid envelope containing the manufacturing order A, the standard operation sheet, the blue print and the job ticket CC is returned to the dispatcher and indicates that the job need not be followed up further. The dispatcher then withdraws all data pertaining to this order and sends this to the accounting department for cost purposes.

To summarize, the orders which have taken care of the production have been in two groups, first what may be called the manufacturing orders A, B and C, which in turn are, respectively, a notification to the manufacturing department that the job is to be done, a requisition to the stock room for the tools and stock and a bulletin to the dispatcher that the job is under way and must be followed up. The second group comprises the four similar job tickets which first notify the payroll departments that the job is under way and that workmen are employed thereon; the second tells the ticket writer and in turn the inspector that the previous job is ready for inspection; the third is a traveling record accom-



The skeleton of forms upon which is based the system put into the Eisemann plant and which is already resulting in increased production. Forms A, B and C are in triplicate except C, which has a record on the reverse side for cost accounting purposes. AA, BB, CC and DD are in quadruplicate and form the job tickets. The starting time slip puts the job under way. These manufacturing orders and job tickets are the main supports in the framework of the system, the balance of the blank being more or less in the nature of by-products of production

panying the job through every operation until its completion, and the fourth goes to the dispatcher, notifying him that the job has been started.

In a system of this kind there are a number of by-products which take care of extraordinary circumstances. Also, there are non-producing departments which must be looked after. For instance the shipping department. This is handled by a quadruplicate shipping instruction ticket which is issued by the production department upon the receipt of the final job ticket, one slip going to the general manager for final credit O K authorizing the shipment. After this O K has been granted the remaining three slips go to the shipping department and one is placed in the box as a packing slip, the third goes into the shipping clerk's own files, and the fourth returns to the production department with B. of L., etc., showing that the order has been shipped. The production department delivers the slip finally to the invoice clerk, who makes the proper billing and files with the original order and all correspondence pertaining thereto.

Irregular circumstances such as the rushing of one order, the taking of a man from one job and placing him on another, the replacement of parts that have been broken or the deductions from a man's pay of articles broken through willful neglect or carelessness, overtime, lost time, etc., are all provided for in separate slips.

This, then is the method which has been selected for group production which must be used in a magneto and which would of course apply to other manufacturing jobs where vast numbers of small parts and minor operations are involved. When an order comes in for a number of magnetos, say 1,000, it will necessitate perhaps eight main groups which must be manufactured absolutely independently until the final assembly is reached. These jobs, like the spokes of a wheel, converge toward the hub, which is the final assembly. But this is not all. Beyond this main grouping is another division into sub-groups, which may in turn be still further sub-divided. Thus, if one of the groups be the armature, this may be sub-divided into other groups, such as the core, the winding, the condenser, etc. The order blanks make the chain complete, for a separate manufacturing order is issued for each of the main groups, and then another order for each of the sub-groups. Each of these orders carries with it, as has been shown, a requisition for the material needed and the tools required to perform the work.

Factory Layout Helps System

Hand in hand with the system employed, the layout of the factory helps towards the successful fulfillment of the object. As the system forms what may be called a series-parallel connection of small groups of units, so does the factory layout constitute a continuous chain of these manufacturing groups.

The plant occupies a very long oblong space, extending the entire length of the top floor of one of the huge Bush Terminal buildings. This long space is in turn subdivided into three other oblongs by two walls running squarely across the space separating the central part from the two end portions. At each of these divisions are the elevators, thus providing two separate passages for the materials. These passages are separated from one another by the whole length of the central portion of the plant. These have been logically utilized by employing one solely for incoming material and the other for outgoing. Adjoining the incoming is a receiving and raw material inspection department, and adjoining the outgoing is the shipping room.

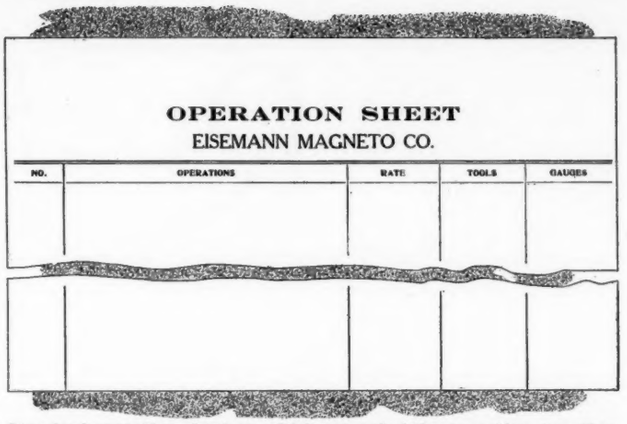
Manufacture moves by steps from one end of the building to the other, generally tending to travel in the shape of a fish-hook. At the base of the hook is the receiving and raw material inspection department, together with the main stock room just behind. Step by step, operation proceeds along the shank of the hook until assembly is reached at its top extremity and then proceeds to work backwards to the testing department, from where, like the barb on the hook, it proceeds into the shipping room. There is one exception to this uniform step-by-step process, and that is in the winding and condenser department, where women are employed and which hence is kept secluded from the remaining part of the plant. Here the armatures are largely completed, and although entailing carrying the material to and from the department away from the remainder of the plant, the benefits of seclusion are reaped and, since the weights to be handled are small, no noticeable loss is felt.

The administrative, technical and sales departments are arranged in a row along the windows at the opposite end of the plant from the final assembly. They are close together and convenient for interdepartmental communication and consultation. Another portion of the building is devoted to the service work, and in addition there is an experimental department for routine and research work. Dressing rooms and lunch rooms for men and women are also provided. Also to

take care of normal expansion, the Eisemann company has far-sightedly secured an additional space adjoining that in which the final assembly work is now carried on, so that when necessary this can be utilized without disturbing either system or layout.

Plenty of Light for Machine Work

The arrangement of machines is such that small detail work is carried on in close proximity to the source of light. This source is a series of large windows which extend the entire length of the plant on each side. It must be remembered that Bush Terminal buildings are laid out in a large U shape, and the Eisemann plant takes in the entire branch of one of these U's. Thus, light enters from both sides. Arranged along the wall in the direct flow of the light are the small parts manufacture, inspecting, assembling and testing departments. In the center are the larger special machines which do their work either automatically or semi-automatically and do not require a great use of eyesight on the part of the operator. Since the plant is on the top floor, skylights illuminate these machines. This system puts the light where it is needed and makes for the best possible work and the complete best attainments of the results from the precision tools which are needed in manufacture.


OPERATION SHEET

EISEMANN MAGNETO CO.

NO.	OPERATIONS	RATE	TOOLS	GAUGES

Standard operation sheet on which are noted the operation, together with the tools, gauges and rate of pay for any stated job

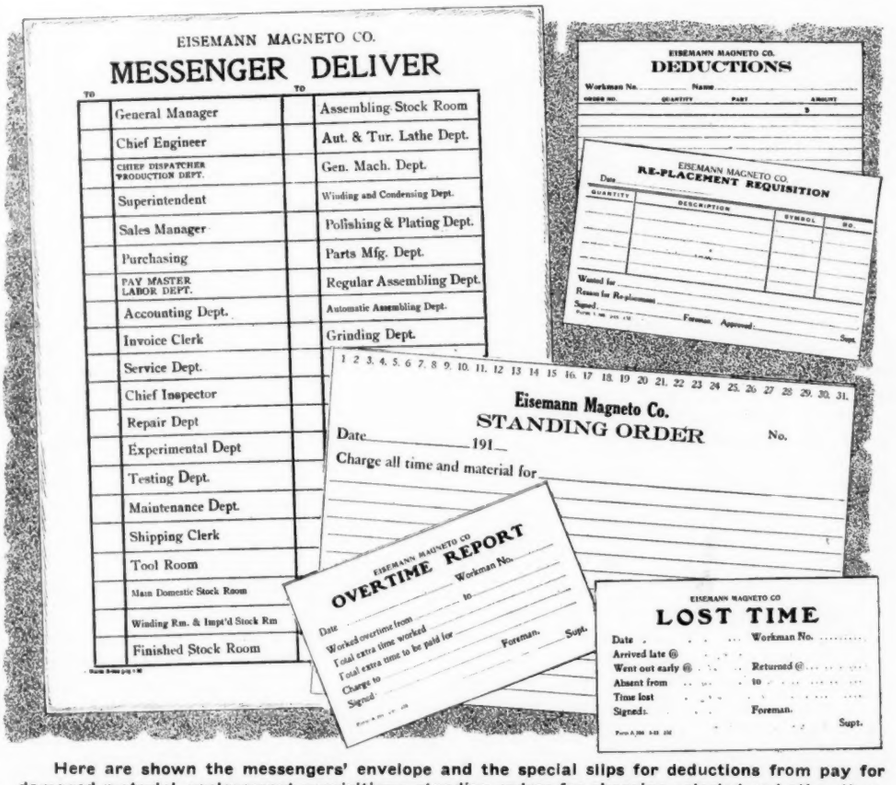
Broad aisles, light, good air, lunch rooms, lavatories and general conditions essential to the welfare of the workers have as much to do in many ways as the installation of production methods. They are part of a well-balanced plant and are a factor in Eisemann results.

Building Chassis for the Trade

A NEW wrinkle in the automobile business is the plan of the Pontiac Chassis Co., Pontiac, Mich., a new concern whose incorporation was announced last week, to build for the automobile trade chassis minus bodies and tires. The customer receives the chassis in this form, mounts his own design of body and top, puts on the tires, and then sells the completed car under his own name. The chassis is built for assemblers only, and it is stated that by this method, the small assembler is enabled to produce a car at as low a price as the larger manufacturer.

The incorporators are R. A. Palmer, of Pontiac, formerly general manager of the Cartercar and Oakland companies; Robert Perkins, secretary of the Massnick-Phipps company, maker of eights and four-cylinder motors in Detroit, and H. H. Brooks, formerly sales manager of the Marathon Motor Works, Nashville, and later of the Herff-Brooks Corpn., Indianapolis. The authorized capitalization is $100,000, and it is said that other Detroit and Pontiac capital is interested in addition to that represented by the above-named principals.

The first design of chassis produced in the plant formerly occupied by the Flanders Mfg. Co., is a 25-horsepower type using the Perkins small four-cylinder engine, which has a bore and stroke of 3 1-4 by 4 1-2 inches. It is an L-head engine with cylinders in a block and three-speed gearset in unit. There is nothing unusual about the chassis or its power plant, conventionally-accepted practice being adhered to. It was described in THE AUTOMOBILE for March 18.


EISEMANN MAGNETO CO.

MESSENGER DELIVER

TO		TO	
	General Manager		Assembling Stock Room
	Chief Engineer		Aut. & Tur. Lathe Dept.
	CHIEF DISPATCHER PRODUCTION DEPT.		Gen. Mach. Dept.
	Superintendent		Winding and Condensing Dept.
	Sales Manager		Polishing & Plating Dept.
	Purchasing		Parts Mfg. Dept.
	PAY MASTER LABOR DEPT.		Regular Assembling Dept.
	Accounting Dept.		Automatic Assembling Dept.
	Invoice Clerk		Grinding Dept.
	Service Dept.		
	Chief Inspector		
	Repair Dept		
	Experimental Dept		
	Testing Dept.		
	Maintenance Dept.		
	Shipping Clerk		
	Tool Room		
	Main Domestic Stock Room		
	Winding Rm. & Impt'd Stock Rm		
	Finished Stock Room		

EISEMANN MAGNETO CO.

DEDUCTIONS

Workman No. ..... Name .....

ORDER NO.	QUANTITY	PART	AMOUNT
			$

EISEMANN MAGNETO CO.

RE-PLACEMENT REQUISITION

Date .....

QUANTITY	DESCRIPTION	SYMBOL	NO.

Wanted for .....

Reason for Replacement .....

Signed: ..... Foreman. Approved: ..... Supt.

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

Eisemann Magneto Co.

STANDING ORDER No.

Date ..... 191_

Charge all time and material for .....

EISEMANN MAGNETO CO

OVERTIME REPORT

Workman No. .....

Date .....

Worked overtime from ..... to .....

Total extra time worked .....

Total extra time to be paid for .....

Charge to .....

Signed: ..... Foreman. Supt.

EISEMANN MAGNETO CO

LOST TIME

Date . . . . . Workman No. .....

Arrived late @ . . . .

Went out early @ . . . . Returned @ . . . . .

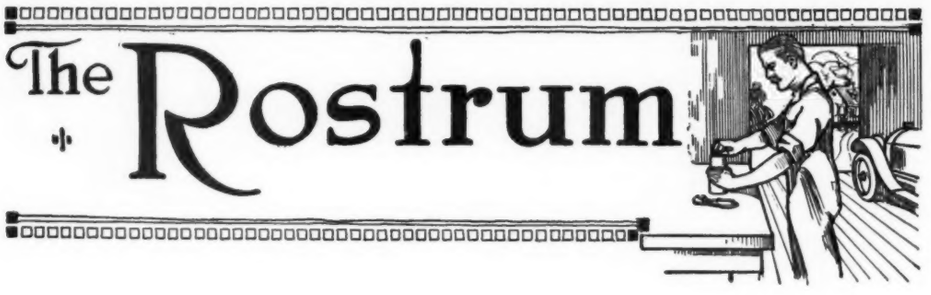
Absent from . . . . to . . . . .

Time lost . . . . .

Signed: . . . . Foreman.

. . . . Supt.

Here are shown the messengers' envelope and the special slips for deductions from pay for damaged material, replacement requisitions, standing orders for charging salaried and other time, overtime report and lost time. The tags are the by-products of the system and take care of extraordinary circumstances in the Eisemann plant



Battery Needs Recharging or Overhauling

EDITOR THE AUTOMOBILE:—The storage battery seems to charge on my 1915 Hudson model 6-40, so that it will furnish current for the lights and start the motor. Then, suddenly, it will become discharged. Where should I look for the trouble? It discharges 1.125 specific gravity.

2—Can a Bosch high-tension dual-system be attached to this motor?

Lima, Mont. E. R. GLEED.

—From the information you furnish it would seem that the battery is either completely discharged or you have a short circuit in the system. It would seem quite likely that it is the former and if this is the case a thorough recharge will remedy the difficulty unless the battery has been left in the discharged condition for too great a length of time. If so, the battery will probably require overhauling. The symptom for this trouble is exactly what you describe, *i.e.*, the battery starts the motor and also gives a very bright light for a few moments, and then apparently becomes dead.

2—A Bosch dual system can be made up for the Hudson 6-40 car by means of a bracket which will be especially designed for the car. These installations are provided by the Bosch company or, if desired, can be made by you by simply securing a bracket which will take the standard magneto base supporting screws and then fastening the bracket to the car and the magneto to the bracket.

The Delco system which you have on this car should give you perfect satisfaction in every respect and it is very possible that the only reason it is not working properly is through a defective or damaged cell. This may be caused either by the piling of sediment in the bottom or disintegration of the separator which permits an occasional contact of the plates, resulting in quick discharge. If the trouble is not remedied through the advice under paragraph 1, it would be well to look here. A diagram of this system is given in Fig. 1.

Oil Gauge Probably at Fault

Editor THE AUTOMOBILE:—As a subscriber to your magazine, will you give me a solution to my troubles with carbon? I find it necessary to either burn or scrape out the carbon from my motor at least every 400 miles, sometimes less. I removed it between fifteen and twenty times last season, having run nearly 8,000 miles. I have tried all kinds of oils with various results, the more expensive oils giving the best. Have also tried different size jets in the carbureter; putting kerosene in the intake every week while the engine is hot; carrying the oil level about half full, etc., but to no avail. The manufacturer has not been able to help us yet.

I have also tried leak-proof piston rings but they did not give the desired results. The engine is made by a very reliable firm and in my judgment is over-oiled. The pipes from the oil-pump supply the main bearings, overflowing on to the crankshaft and thence being thrown by centrifugal force, into the cylinders. The pistons have three rings and two oil grooves. Underneath the lowest ring are six holes through the piston. The connecting-rods have large pressed steel scoops which dip in the oil 3-16 inch.

My solution of the trouble is to build a box over each main bearing to hold the oil and to install overflow pipes from these boxes to the connecting-rod troughs. Also to put in new pistons without the holes beneath the lowest piston ring. Finally to replace the steel dippers on the connecting-rods with smaller brass pipes dipping the same distance.

Do you think this would remedy the trouble? I expect more carbon trouble with the high-compression motor than with the old style, but it seems to me I am getting more than my share.

The motor never misses either at low or high speeds and runs beautifully when free from carbon.

Pittsfield, Mass. EARL L. JOHNSON.

—The cause of carbonization in this motor is probably due to too much oil being pumped into the cylinders. This would be due to the gauge on the oil base not registering correctly and hence bringing the oil level too high. It is suggested that you empty all the oil out of the oil base, cleaning it thoroughly with kerosene and then refilling with 21 pints of engine oil. If the gauge does not register full at this point, bend it until it does. The illustration, Fig. 2, shows the method of checking the oil dip.

Poor Final Contact Stalls Starter

Editor THE AUTOMOBILE:—I am driving a Paige 25, 1914 model and not being very familiar with the electrical part of same, would ask if you would kindly answer a few questions. This car has a 12-volt Disco starting and lighting equipment.

First, on the dash it has an indicator made by the Dungan Co., of Detroit, which I would like you to explain. It consists of a round glass with a small hole in black dial. When I turn the current for light, a white dot shows in the hole in the dial. When the current is turned off you can see nothing to indicate whether current is going into battery or not.

Now, I would like to know that if, instead of the above indicator, I could install an ammeter which registers both charge and discharge; thirty points both ways? If so, shall I connect it to the same wires?

2—I have a voltmeter, and would like to know if it would be to any advantage for me to have this connected to the battery? If so, please show me how and where to wire it.

3—When I press down on the starter pedal, the electric motor starts but when it engages with the flywheel it stalls, seeming not to be able to turn the engine over. This used to work all right, but lately it has not. The battery is very well charged. Can you give me any advice regarding this?

New Brunswick, N. J. JOHN C. HUNT.

—This is merely a form of indicator to show whether the current is circulating or not. For instance, with the motor running and the lights turned on the current is being supplied directly from the generator, this instrument not being

strong enough to send a charge to the battery at the same time so that no current is passing through the indicator and naturally the white dot does not appear.

With the motor running and the lights turned off the current is passing from the generator to the battery and the white dot then appears in the indicator, showing that the current is circulating.

If the motor is dead and the lights are turned on, current is being supplied from the battery and the white dot then appears in the indicator, also showing the circulation of current.

2—It does not seem to be any advantage in connecting a voltmeter to the storage battery. In fact, it would be useless equipment as the voltage does not show the volume of current. Test the battery with hydrometer at least once per week; each cell should show a solution registering 1.275 or 1.3 and if below that the motor should be run long enough to bring the charge up to this point.

3—The trouble with the starting motor stalling when the pinion is meshed in the teeth on the flywheel is due to a weak final contact in the starting switch. It would be advisable to clean the switch and then readjust the plunger to get a good contact.

Using Starter Motor as Generator

Editor THE AUTOMOBILE:—A short time ago you explained the voltage of the Ford magneto at a speed of 980 r.p.m. The voltage varies from 16 to 24 and amperage depends upon voltage but you did not state the amperage. As 12 or 14-volt bulbs are used in the head lamps of the Ford, is there not danger of burning them out at, say, 24 volts?

2—What is the magnetic pull or how many pounds will a Ford magnet lift?

3—What amperage does an Atwater Kent coil take?

4—If a 6-volt starter motor were turned into a generator, what would be the probable amperage and voltage?

Germantown, Pa. J. H. M.

—The lamps adapted to Ford cars are constructed to take care of this varying voltage and very little trouble is experienced with burning out. THE AUTOMOBILE has consulted a number of concerns in this business and they state that they have had no trouble of this kind.

2—This is such a variable quantity that it cannot be answered definitely.

3—Tests made by the makers on the Atwater Kent system show that at 1,000 r.p.m. of the crankshaft the current reading is .24 ampere. At 500 r.p.m. the current used would be one-half this. The spark heat, however, would be the same at the low speed as at the higher velocity, the difference in primary current consumption being due simply to the fact that a definite quantity of current is consumed per spark and the number of sparks, of course, increases in proportion to the speed.

4—These starting motors are series-wound machines and consequently cannot be used at all as generators for supplying constant voltage lighting circuits or for charging a storage battery. The only way in which the starting motor could be used as a generator would be to completely rebuild it, providing for new armature and commutator construction with suitable field and armature windings. The characteristics of such a rebuilt machine would have no relation to the characteristics of the original series-wound motor.

Piston Displacement Figure Corrected

Editor THE AUTOMOBILE:—If the piston displacement of a single cylinder equals bore times bore times stroke times .7854, the piston displacement of a multiple-cylinder engine would be bore times bore times stroke times .7854 times number of cylinders.

In THE AUTOMOBILE for February 18, page 327, you will notice that the piston displacement of a six-cylinder engine 5.75 by 6.5 is given as 506.4 cubic inches. The figure obtained by the above formula is 1012.72.

Cleveland, O. J. PARKS.

Laboratory Tests on Radiator Efficiency

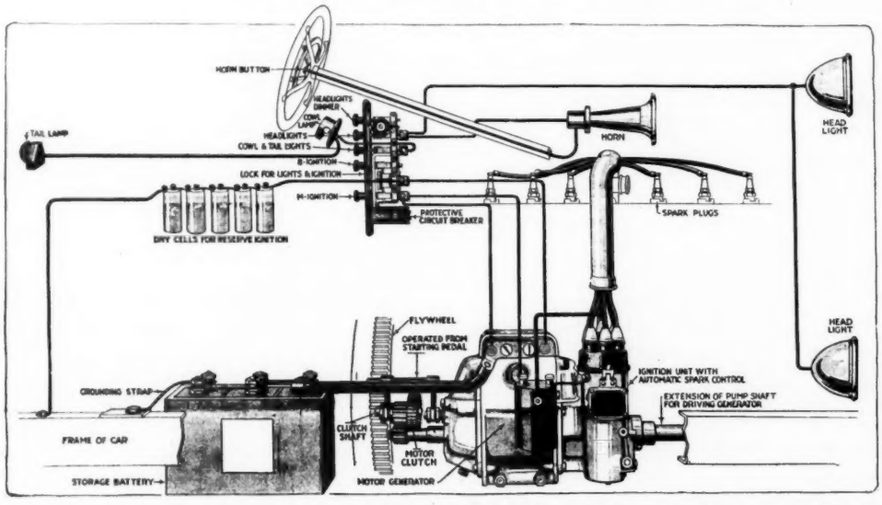
Editor THE AUTOMOBILE:—Will you kindly send me a few suggestions for conducting efficiency tests on automobile radiators where efficiency is understood to be the cooling effect per square foot of radiating surface.

Laboratory tests are to be made on several different makes of radiators and the radiators are not to be mounted on a car.

Louisville, Ky. H. O. WAGNER.

—A laboratory test on radiator efficiency is not a very difficult one to make. There are three variable factors which you will have to accurately measure. One is the temperature of the water entering the radiator; two, the temperature of the water leaving the radiator; three, the temperature of the air surrounding the radiator. If you have any type of blower to force a draft against the surface of the radiator, you will then have to know the velocity of this draft.

It is, of course, assumed that you have accurate knowledge of the number of square feet of radiator surface and also the volume of water which is passing through the radiator in pounds per minute. It must be remembered in making these tests that the foundation of all your results will be read in terms of the amount of heat units carried off in



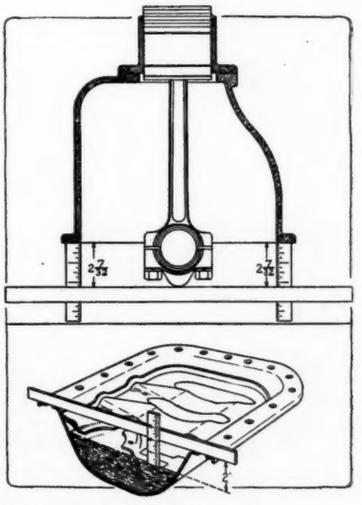


Fig. 1—Diagram of the Delco system as used on the Hudson 6-40. Fig 2—Checking the oil dip on Hudson 6-40 motor

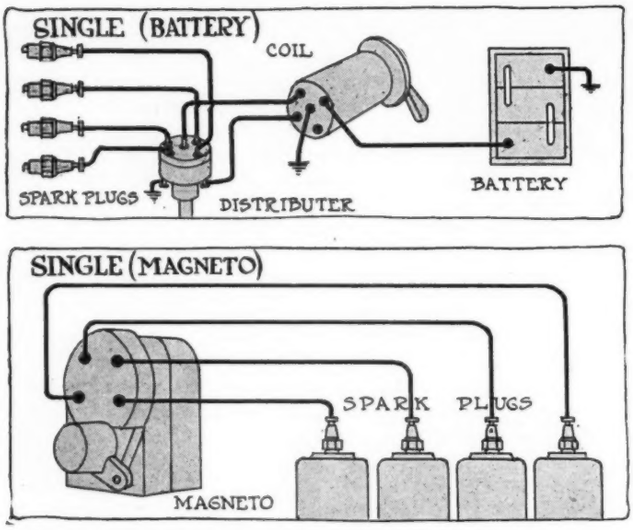


Fig. 3—Diagrammatic representation of single ignition systems

a unit of time by a given weight of water per square foot of radiating surface. This figure gives you your radiator efficiency.

To give a concrete example, if the area of the radiating surface is A, the temperature of the water entering is T, the temperature of the water leaving the radiator T1, the amount of water passing through the radiator P pounds per minute, then the heat units carried away by the radiator will be P(T—T1)B.t.u.

The heat units carried away per unit of area will be: $\frac{(T-T1)P}{A}$ and the heat units carried away per pound of water per unit of area will be $\frac{(T-T1)}{A}$ for any fixed condition of draft. Radiators can of course be directly compared by maintaining the draft conditions constant.

Parts for Old Model Thomas

Editor THE AUTOMOBILE:—I recently purchased a second-hand Thomas roadster. According to the number of the plate it is a Model D, and should judge was made in 1909 or probably 1908. It has four 5-inch cylinders, 5 1-2-inch stroke, has two entirely separate timing systems, one driven from the camshaft for battery ignition, the other a high-tension Bosch magneto. Can parts be obtained from Buffalo of the E. R. Thomas Motor Car Co.?

In taking down the engine for overhauling we found that the magneto was advanced three teeth of the timing gear, and would ask whether it should be necessary to do this with an engine of this size which we should suppose would have all the power and speed necessary without. Any information you can give me about this machine I would be very glad to receive.

E. Brookfield, Mass. B. M. S.

—Parts can be secured from J. Rosenfield, 521 Sixth street, South Boston, Mass., which will be quite handy for you. They can also be secured from the E. R. Thomas Motor Car Co., Buffalo, N. Y.

The timing for the magneto will be correct if you set it so that at full retard the spark occurs on upper dead center.

Wheels Pitched, Canted or Dished

Editor THE AUTOMOBILE:—To settle an argument, will you kindly tell us the proper term to use when speaking of tip in front wheels, that is, when they are farther apart measured at the top of the tires than they are at the bottom.

A calls it cant, B calls it staggered, C calls it pitch, D calls it dished. Will you please explain the difference in these terms?

Worcester, Mass. J. B. D.

—The meaning of the word cant is the condition of having a sloping or slanted position. Therefore, this can be correctly used for that purpose. The word staggered, however, does not fit at all. Both pitch and dished are also correct.

Re-Silverizing Reflectors for Lamps

Editor THE AUTOMOBILE:—Can I silverize glass reflectors? Can an amateur do this work and if so what are the ingredients and in what proportions?

2—Is it possible to adjust the detachable rims on a 35 by 4 wheel so that a 36 by 4 1-2 tire can be put on? If not, what is the reason? The wheel at present will take a 34 by 3 1-2 or 35 by 4 tire.

3—What size of a carbureter will give the best results on a four-cylinder 4 by 4 1-2 engine?

Springside, Sask., Can. P. E. FERNIE.

—An amateur can silverize reflectors but it is very difficult to get a good job. The method by which this work has been carried out is as follows: First, fasten to a block of wood the finest possible grade of emery cloth. With this the reflector is smoothed down to a fine finish. It is next necessary to have a melting pot and a thermometer which is capable of measuring more than 212 degrees. Two ounces of lead, 2 ounces of tin and 4 ounces of chemically pure bismuth are melted together. Eight ounces of mercury are added at 212 degrees Fahrenheit and mixed with the melted mixture. This is applied while warm with a smooth camel's hair brush.

2—A 36 by 4 1-2 tire can be put on a 35 by 4 rim because this is the oversize for that tire. It cannot however be put on a 34 by 3 1-2 rim as the oversize for this is the 35 by 4 and not 36 by 4 1-2.

3—For a four-cylinder 4 by 4.5 motor use a 1 1-4-inch carbureter.

Ford Abandoned Six for Four

Editor THE AUTOMOBILE:—Will you kindly tell me in THE AUTOMOBILE why the manufacture of Ford six-cylinder cars was discontinued?

2—What year were they made in?

3—Were they practical, and if not, why?

Ellington, Conn. E. A. BRACE, M. D.

—The manufacture of Ford six-cylinder cars was discontinued because it was decided to concentrate the entire attention of the plant upon one model and that a low-priced car. It was not considered practical to undertake the building of both fours and sixes under the policy outlined by this concern.

2—These cars were manufactured during 1906.

3—A large percentage of the Ford sixes are still in active service and the machine was only discontinued for the reason stated above.

Finds Knock When Running Idle

Editor THE AUTOMOBILE:—I have a Ford engine and would like to know what causes a dull knock when engine is running slowly when idle. With both throttles retarded, the valves in good shape, and the connecting-rods tight, this knock seems to be in the fore part of engine.

Ellwood City, Pa. LEROY HAZEN.

—The knock is due to some loose part which must be found by process of elimination, as it is impossible to determine where it is from the data which you have furnished. The probability is that you will find this knock by examining the main bearings for looseness, the flywheel connection, and the

crankshaft which may have become flattened. If the pistons are worn so that they have become loose a knock of this kind may also be given by the slapping of the pistons against the cylinder walls.

Systems of Electric Ignition Defined

Editor THE AUTOMOBILE:—Will you please explain the difference between the dual, double, single, two-point and duplex electric ignition systems?

Landinville, Pa. H. T. H.

—The differences between these systems of ignition can be understood more clearly by diagrammatic explanation than by a descriptive. Referring to Figs. 3 and 4, the differences between these systems are clearly brought out. To sum up: The dual system employs two independent sources of current but uses a common set of spark plugs and a common high-tension distributer. The double system employs two independent systems throughout with two sets of spark plugs, two sources of ignition, two coils and two distributers. The single ignition system has but one source of current, one transforming system, one distributer and one set of plugs. Two point ignition is where two sparks occur at the same time in the cylinder. It must of necessity, therefore, involve two sets of plugs and synchronized distributers.

Duplex ignition is that in which both a battery and magneto current source are used but in which the battery is connected with the magneto armature in such a way that it can produce a high-tension spark by means of the secondary winding of the magneto or aid the primary at low motor speeds.

Long Wheelbase Consumes Less Power

Editor THE AUTOMOBILE:—Will you please advise us if it takes any more power to operate a long wheelbase car than it does to operate a short wheelbase car, provided the weight of the cars is the same, or in other words, does a gasoline engine lose power in transmitting it to the rear axle system if the driveshaft is a long one.

Huntington, W. Va. MOTOR SALES CO.

—For a car of the same weight and all other conditions being the same it will not take any more power to operate a long wheelbase car than it does a short wheelbase as there is no loss of power through the solid shaft. In fact, the advantage would be in favor of the long wheelbase because the angle of the shaft would be less and it would nearer approach a straight line drive which is the most efficient. Another point which is in favor of the long wheelbase is that for the same weight a shorter car would be higher and hence the wind resistance would be greater.

Gearbox Probably Out of Line

Editor THE AUTOMOBILE:—I have a 1909 Cadillac 30 on which a universal joint is used between engine and transmission, this universal consisting of a cross floating in the yokes of clutch and shaft; the assembly, unless kept carefully adjusted, is noisy, and its construction does not permit of oiling so as to retain oil for any length of time, as centrifugal force throws off oil or grease, although this eventually finds its way out, and is thrown off, making a dirty mess of the floor boards. I have noted from time to time in the columns of THE AUTOMOBILE descriptions of different leather universals, designed for same use as the universal on the 1909 Cadillac, but these, unfortunately, have been lacking in details, so have been unable to attempt the application of them to my car.

Denver, Colo. WILLIAM A. WEIGELE.

—The joint between the engine and gearbox is designed to take up any misalignment between the clutch and the gearshift, but it very often happens that the gearbox drops throwing the shaft out of alignment to such an extent that the drive becomes noisy and this is probably the cause of your trouble.

It is doubtful if the fitting of a leather universal would be wise, because although it would silence the drive, it would take care of the misalignment, the noise which shows that there is a faulty alignment would be gone and there would be no warning to enable you to know when to correct this. It occasionally happens that a sudden jolt will cause a drop in the level of the gearbox due to a looseness in the bolts which hold it in position. This can be corrected by restoring the gearbox to its proper alignment.

It is also very probable that the rear axle gears are badly out of adjustment and that the vibration produced as a result of this is transmitted to the joint between the engine and gearbox and given off at that point.

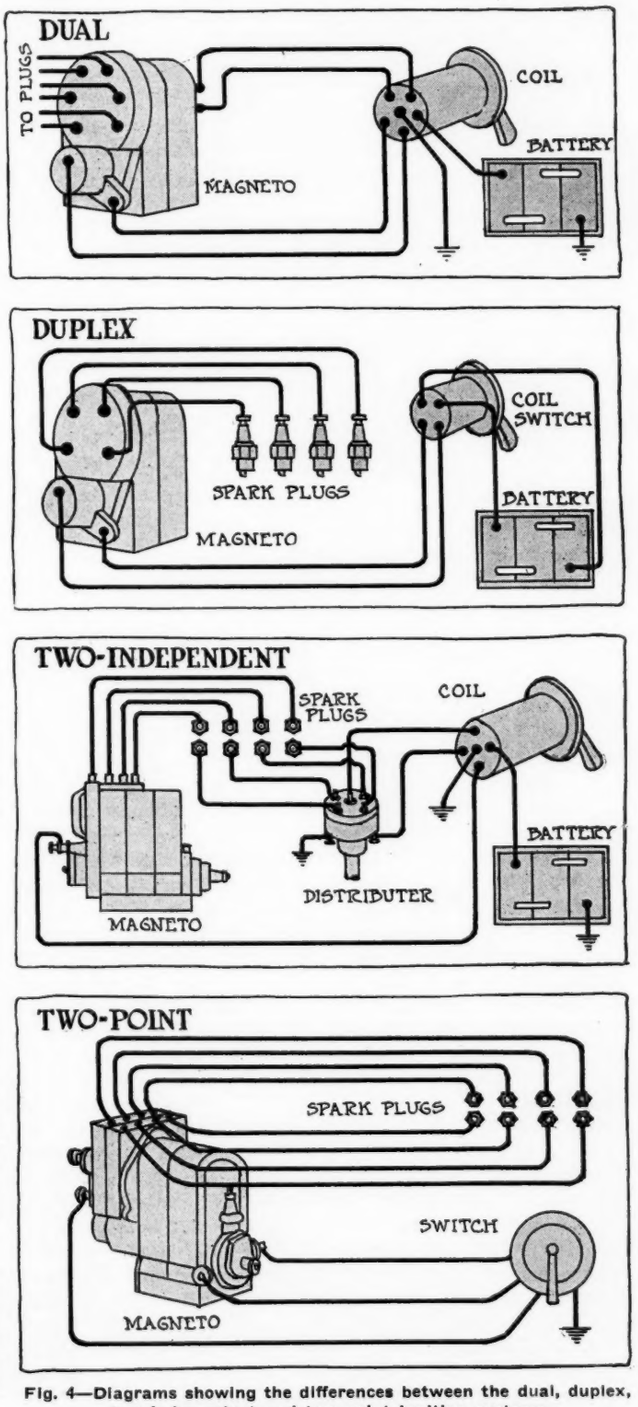


Fig. 4—Diagrams showing the differences between the dual, duplex, two-independent and two-point ignition systems

The Period of Oscillation—Its Relation to Flexibility and Strength

Defining Spring Properties by: — DF = nL : (10 ± m)

(The Improvement of Spring Systems—X)

By M. C. K.

IT was the upshot of article IX that the figuring of a time schedule for the movements of springs, vehicle body and running-gear after a single sharp knock led to certain incongruities unless the figuring could be done with strict reference to the period of oscillation of the springs, and that for this reason, mainly, the chart of these movements presented in Fig. 23 could not pretend to be accurate in the time values, even if it presents the sequence of the movements nearly in accordance with actual conditions and admits a number of fairly safe inferences for the particular condition to which it refers. As the time in which the spring acts against the load or against the running-gear is one of the most important elements for determining severity of shocks and degrees of comfort, ranking second only to vehicle speed and gravitation, it is found necessary for further progress with the subject to arrive at a definite understanding of the manner in which the period of oscillation influences results and how it must be taken into account in the figuring.

Period Differently Understood

It is first noted that the period of oscillation is a term which in practice is only vaguely defined. When it is commonly held that the period should not be shorter than 3/5 of a second, or at the rate of 100 oscillations per minute, the reference is seemingly to the whole set of conditions under which the spring operates in the completed vehicle, as the rule is derived from a practical estimate of the riding qualities obtained and from diagrams automatically produced by recording instruments showing the number of oscillations per minute. But vehicle conditions include many forms of friction in addition to the friction of the spring leaves, and the aggregate of the work thereby imposed on the springs retards their action and lengthens the period. If spring dampers are used, it is for the specific object of lengthening the period or that portion of it which applies to the spring rebound, and to that extent producing one of the desirable effects which are secured by using long and flexible springs without being troubled with the amplitude of the oscillations of such springs or with the cost and incumbrance which go with their length. To become a useful term for characterizing the properties of a spring, the idea of the period of oscillation must of course be dissociated from these complications, or else a new term should be introduced to indicate the spring properties which affect the duration of the period, and the old term may then be used in referring to the results obtained in vehicle practice. To use the term in both ways, as is now loosely done, naturally leads to confusion, especially when it is one of the principal objects of an inquiry to arrive at conclusions with regard to the best methods for interfering with the natural spring oscillations with a view to greater comfort and security.

A brief examination of the term and the factors it stands for discloses the remarkable need of a term of this nature, in some form, for describing definitely the most important properties of springs. That is, a term which will give in one breath an adequate idea of the combination of flexibility, strength and working capacity of a spring for a given set of working conditions is one of the very first requirements for being able to compare spring values, both as to their efficiency and their cost, and for overcoming the popular tendency to assume that strength or static carrying capacity and flexibility are the only mechanical factors to which a specification of leaf springs need to refer.

T a Function of Suitable Dimensions

An unloaded spring comes to rest very quickly after a shock, as its mass is insufficient to carry the momentum for producing a large oscillation after the spring has returned to its initial position. Likewise a heavily loaded spring comes to rest quickly, because the spring energy is rapidly exhausted by the increased friction and inertia. At both extremes spring oscillation is reduced in amplitude, while the oscillation period is reduced in the first case and lengthened in the other. From these considerations alone it is clear that the period of spring oscillation must be a factor related largely to the load and the capacity of the spring for handling its load. A numerical value for the period therefore expresses this relation, and herein lies its practical value. Combined with a numerical value for the flexibility it expresses all the dynamic properties which are of interest. ("Life" in one sense relates to prompt resilience and in that sense is identified with the period of oscillation. In its other sense, referring to durability or stability of properties, it is an economical term.)

It may therefore be defined as an object at the outset to find a simple expression for "dynamic flexibility"—coining this term for want of a better or recognized one—in which the value of the period of oscillation shall be incorporated in such a manner that it, and also the values for flexibility proper and for beam-strength proper, can readily be separated from the combination term; while the question of "life" must probably remain a compound one in which not only the working capacity of the spring in relation to its work but also the metallurgical properties are involved.

The theoretical value for the period of oscillation of a spring is formulated (without regard to its weight) on purely kinetic principles and equals THAT OF A SIMPLE PENDULUM WHOSE LENGTH IS EQUAL TO THE DEFLECTION f CAUSED BY THE LOAD P WHICH IS THE ADMISSIBLE LOAD OF THE SPRING. This is correct, because the admissible load is the same as the load limit within which the analogy of the pendulum holds good.

From this we have: T (the period in seconds) $= \pi\sqrt{\frac{f}{g}}$ (in feet)

The admissible load of a spring must therefore be determined before the period can be figured, and the admissible load is figured according to formulas which are to some extent empiric and in regard to which no complete agreement exists. The extraordinary working capacity demanded of automobile

springs and the properties of the alloy steels which have been developed to meet these demands must also result in an eventual revision of the admissible load limits. The latitude which under these conditions exists in theory merely relates to the difficulty of representing actual conditions by few and simple mathematical symbols. In reality the admissible load of a definite spring is definite, though it may be unknown.

What Is Admissible Load?

The standard American formula for admissible load makes it a function of the tensile strength of the spring material, while the revised formula recognized in the *Hütte* (the engineering manual of the *Verein Deutscher Ingenieure*) makes it the same function of the admissible bending tension of the spring material (not of any given leaf spring). The different numerical values of the units employed—inches, centimeters, etc.—come somewhere near equalizing the results obtained from the two formulas. While the German formula is the more logical one, it has the great disadvantage that the admissible bending tension of a material in general, calculated from unit dimensions, is much more difficult to ascertain than the tensile strength of a standardized test piece. It also varies for static, suddenly applied and alternating stresses. While for ordinary hardened spring steel it is figured as not necessarily exceeding 4,800 kilograms per square centimeter, it is given as 6,500 kilograms for the grade of steel required for railway car springs, with allowance of a play in practice up to 8,600 kilograms. As the play required for automobile springs is much greater and weight is an important factor, it would probably be a matter calling for extensive experimental work to fix a suitable value for the admissible bending tension for automobile spring material, though a tentative scale might be established running from 6,500 kilograms per square centimeter upward to 8,000 or 9,000 kilograms, according to the grade of steel it is contemplated to use in any given case. The relation of the tensile strength of a material to the resilience or the admissible bending tension of leaf springs made of this material, which is taken for granted in the standard America formula, is doubtless much less safe to figure with now, if fine alloy spring steels are used, than it was formerly, since the strength of these steels varies considerably according to the direction of the pull.

The difficulties which arise by using either of the formulas may be illustrated by applying them to a concrete case. Let it be the object to find the admissible load of a spring, semi-elliptic, 36 inches long, 6 leaves, 2.67 inches wide, leaves uniformly 0.25 inch thick and made from a material giving a tensile strength of 200,000 pounds per square inch from a standard test specimen duly hardened to compare with its condition in the spring.

The American basic formula for one-half of a semi-elliptic spring, is:

$$\text{P (safe load)} = \frac{n}{6} \cdot \frac{bt^2}{l} \cdot \text{S}$$

in which n is the number of leaves, b width, t thickness, l length and S tensile strength.

The German formula is $\text{P} = \frac{n}{6} \cdot \frac{bt^2}{l} \cdot k_b$,

in which kilograms take the place of pounds and centimeters of inches, while k_b is the admissible bending tension in kilograms per square centimeter.

To apply to semi-elliptic springs, where l is twice as large, results should be multiplied by 4.

It is noticed that for otherwise equal conditions P is inversely proportionate with l, the length, and this applies to all springs whose deflections are proportionate to the loads; a condition which is rarely found to be accurately materialized in springs in which the main leaves are double or thicker than the others, though it is nearly always aimed at.

Inserting the numerical values, one gets the following from the American formula:

$$\text{P} = \frac{6}{6} \cdot \frac{2.67 \times 0.25^2}{36} \times 200{,}000 = \frac{0.166875}{36} \times 200{,}000 = \frac{33375}{36}$$

$= 927.1$ pounds

or an admissible load of $927.1 \times 4 = 3708.4$ pounds.

Converting the inches into centimeters and choosing a trial value of 8,000 kilograms per square centimeter for the admissible bending stress k_b one gets

$$\text{P} = \frac{6}{6} \cdot \frac{6.8 \times 0.635^2}{91.44} \times 8{,}000 = \frac{6.8 \times 0.403}{91.44} \times 8{,}000 = \frac{91.44}{21923.20}$$

$= 239.7$ kilograms or 527.6 pounds.

This makes the admissible load only 2110.4 pounds, which is more nearly in accordance with the loads which would be admitted in practice for a spring of the dimensions mentioned and of first-class material. The same result would be obtained from the American formula if the tensile strength were taken as 110,000 pounds instead of 200,000 pounds.

The utility of the formulas is plainly dependent upon havhaving reliable tabulated values worked up for the different grades of steel which come into question and, in case the American formula is preferred, basing the S values on actual spring tests rather than on an assumed relation between the tensile strength and the spring strength, since this assumed relation is in reality a relic of a conception according to which the laws relating to beams of a narrowly limited elasticity were applied to determine the strength of springs and the figures for tensile strength were assumed to be represented in pro rata figures for bending, while the matter of shock and alternation of stresses was ignored.

Until these data have been brought into existence and subjected to verification, THE ADMISSIBLE LOAD OF A SPRING FOR AUTOMOBILES OR MOTOR TRUCKS IS PROBABLY BEST DETERMINED FROM A PRACTICAL ESTIMATE BASED UPON THE MAXIMUM DEFLECTION DEMANDED OF THE SPRING IN PRACTICE, AND TAKING AS THE ADMISSIBLE LOAD THE STATIC LOAD WHICH PRODUCES THIS DEFLECTION. In conjunction with the data which makers of automobile springs possess for the materials they use and the springs they make, it should be possible to devise a provisional formula in which P remains a function of $nbt^2 : l$, while the factor S : 6 or k_b : 6 is revised to correspond to automobile or motor truck conditions.

It seems almost evident that the unusual demands made upon automobile springs should warrant the adoption of special and generally recognized coefficients for determining the loads which they are fit to support. These coefficients would still be subject to tabulated variations according to the materials used and perhaps to a division into two classes according to the intended speed of the vehicles.

The Relations of T

Reverting now to the formula for the period of oscillation, $\text{T} = \pi \sqrt{\frac{f}{g}}$, it is perhaps first notable that it is strictly theoretical to the extent of leaving the friction of spring leaves out of consideration. In fact, it is applicable to coil springs as well as to leaf springs. But this makes it so much more fundamental and useful, as the friction of leaf springs varies, increasing with n and decreasing with b, t and l for any given combination of strength and flexibility, while it can also be varied by special expedients, such as anti-friction films of oil or metal between the leaves, and necessarily is higher for highly curved springs than for straight ones, as the curved spring in action undergoes greater relative changes of the effective spans of the different leaves. The progressively increasing friction of the straight spring is one of its advantages if progressive resistance is not produced by other means.

As compared with the complete formula for pendulums (the development of which can be found in all complete textbooks on physical science) a minor variable factor is omitted, but this factor is negligible in the case of pendulums if the

oscillations do not exceed 8 degrees. In autombile springs the limit of 8 degrees is considerably exceeded, and for large oscillations the formula value of T is therefore a little short, apart from the question of friction. With this exception, the period T is constant according to the abbreviated formula, since f is a constant, being the deflection caused by the admissible load P; that is, a large oscillation takes no longer than a short one, and this agrees with the results observed in practice. All important modifications of this condition must be effected by arranging friction, in any of its forms, so as to increase or decrease with the amplitude of the oscillation.

But while f is constant for any given spring, it is a function of P. If d is the deflection, in feet, for any given load P_1, smaller than the permissible maximum load P, then $f : P = d : P_1$ and $f = Pd : P_1$.

As $d : P_1$ is the coefficient of flexibility when P_1 equals 100 pounds, the formula for T may be revised by substituting for f, meaning the deflection caused by maximum admissible load, Pf : meaning by f now the coefficient of flexibility.

The reversed term for flexibility $F = \frac{P_1}{d}$ in which d equals 1 inch and P_1 is the load causing this deflection can be used, if preferred, being often handier for figuring, and, as $F = 1 : f$, the change can easily be made. If this is done, it is more convenient, perhaps, to figure in inches than in fractions of a foot, which of course can be done if also $g = 32.2$, the factor of acceleration by gravity, is multiplied by 12.

With the changed meaning of f, one has

$$T = \pi \sqrt{\frac{Pf}{g}} \text{ or } T = \pi \sqrt{\frac{P}{12Fg}} = \pi \sqrt{\frac{P}{F.386.4}}$$

The period T is thus plainly shown to involve all the fundamental elements of a spring; depending, as it does, on the safe load, which is in the form of $Z.nbt^2 : 6l$, and also upon the coefficient of flexibility, f, and the acceleration factor g of gravitation.

Groping for a System

It may be noted that while Z is a factor for determining P which is yet to be ascertained for the materials used for automobile springs and the work demanded of them, the errors which would be made by employing the normal figure of 80,000 to 100,000 pounds for the tensile strength of the material might not be very large in the case of the spring steels of the highest grade—whose tensile strength is not quite parallel with their spring qualities—as L should increase with the better quality of material but, on the other hand, should decrease with the severity of the work. These influences may nearly offset one another. Some spring makers figure with slide-rules operating on different standard formulas for the different kinds of springs and make empiric, not to say haphazard, allowances for the grade of the material, while taking as the safe load one 50 to 100 per cent. higher than the load actually to be carried, thereby allowing for the speed of automobiles and the hard spring work resulting from it. But the prevalence of auxiliary coil springs to give the suspension a flexibility which it would not have without them, tends to indicate that serious efforts to fit the leaf spring to automobile work with a minimum of complication is uncommon, other considerations having the first call. While the reasons for this industrial condition may be wholly sufficient, both mechanically and economically, it is also possible that a more definite knowledge of the best means for getting suitable action from simple leaf springs, with dampers, would result in more divided opinions and less experimental improvement of the spring suspension by the vehicle user. The burden of such improvement cannot indefinitely be thrown upon him.

In brief, the industrial demands in spring design may be said to swing more or less rationally under three influences: (1) conventionality, which refuses to depart from leaf springs, (2) cost and convenience of construction, which militate in favor of the shortest possible leaf springs, and (3) the necessity for relatively slow oscillation to produce comfort and avoid spring accidents, and this requirement—in conflict with No. 2—accounts for the willingness to have the public try all sorts of auxiliary devices by which the reduction in amplitude and speed of the oscillations may be obtained.

Good Logic of Practice

As the long spring which gives a suitable period of oscillations does not reduce their amplitude, but must be checked for this purpose, and as the auxiliary coil spring gives a very rapid rebound for small shocks—which is generally believed to be an advantage and may actually be so for cobblestones and similar road surfaces—the preference for trying to accomplishe results by coupling short leaf springs with other elements which will increase the flexibility at one end of the action and increase the resistance and the oscillation period at the other end, is in reality very logical. The groping manner in which it is done is the only objectionable feature.

It may in fact also be contended that the large working capacity of leaf springs which are long enough to give the desired period of oscillation represents a waste of material if the peak of the shock-loads can be absorbed in the same auxiliary devices which serve to lengthen T, the period of oscillation. In weighing all these matters, considerable assistance is obtained from an analysis of the formula for T.

To get acceptable results in practice, it is understood that the T obtained in practice should be not less than 0.6 second. But this is a T lengthened by leaf and vehicle friction Experience is wanted for determining the theoretical T which can be made to give corresponding results by the amount of leaf and vehicle friction which the vehicle construction in each case must involve. It is known that shaft drive produces considerably more friction to lengthen T than chain drive. Cantilever springs are credited with slower oscillation than semi-elliptic springs of the same load capacity and probably follow a different formula that should be evolved and considered separately.

Pending the establishment of a good average value for the theoretical T, one may be assumed, with a value somewhat lower than 0.6 second, for example 0.5 second. By inserting this value, subject to revision by experience, in the T formula, interesting relations are disclosed.

It gives, from $T^2 = \pi^2 Pf : g$, when f is isolated to find the flexibility wanted to give the desired T without assistance of special devices, other than leaf and vehicle friction:

$$(0.25 \times 32) : (3.14^2 \times P) = f = 0.81 : P \text{ or } P = 0.81 : f.$$

Here f is in feet. If it is taken in inches, one has $f = 10 : P$.

Similarly, from the other version of the formula, expressing flexibility by the number of pounds producing a 1 inch deflection, one has:

$T^2F = \pi^2 P : 386.4$, which with $T = 0.5$ gives $F = 0.1$ P.

Dynamic Flexibility—DF

The difficulty experienced in securing suitable spring suspension for light vehicles is at once illustrated by these relations. One-tenth of the admissible load P must give a 1-inch deflection. But the actual static load must not compress the spring unduly. Assume an actual load of 300 pounds, a maximum admissible deflection of 6 inches in addition to the initial compression, and the latter not to exceed 3 inches. F is then 100, and the value of P has to be 10 times larger, or 1,000 pounds, to bring T to 0.5 second. In other words, P must be taken at 100 pounds higher than would be determined by the maximum deflection. The spring of the required flexibility must be figured to a safe load of 1,000 pounds, which makes it long and heavy. The alternative is to make it equally flexible but lighter, weaker and shorter and to absorb shocks and lengthen T by spring

dampers. The heavier spring would, however, require at least a rebound check to moderate oscillations.

The desired term for "dynamic flexibility" may be obtained by considering both the flexibility and admissible load required for getting the right T (provisionally 0.5 second) and the relation of P to the actual load L. We have $10\ F = P$. Calling 10 F the "dynamic flexibility," we have $10\ F = 3\ L$ or $10\ F = 2\ L$ or $10\ F = 2.5\ L$. If it is then said of a spring that it has a dynamic flexibility of, say, 2 L, and the actual load on the spring is 1,000 pounds, it will be known that its ordinary flexibility, F, is at the rate of $2{,}000 : 10 = 200$ pounds to cause a 1-inch deflection (which would involve a set of 5 inches by the static load alone); that the maximum shock or overload deflection for which it is figured is 5 inches (making a total of 10 inches from equilibrium); that it will work within these limits without requiring a damper to moderate the rapidity of oscillations (though it may require a rebound check).

Conceived in this manner, the term "dynamic flexibility" assumes that the flexibility has been made to correspond with the admissible load P, so as to make T right for comfort without interference, and when this has not been done the term would be inapplicable. It can be improved, so as to describe a spring which does not produce a suitable T without assistance. T decreases when F increases, for a given P. For rapid oscillations, requiring damping action, we therefore have $P < 10\ F$. Now, calling F the dynamic flexibility under the symbol DF, we have $DF = 3\ L : 10$ if T is right, but if T is short the value for DF may become $3\ L : 8$ or $2\ L : 9$ or, in general, $DF = nL : (10 \pm m)$. The difference between the divisor and 10 will then indicate the need of a damping action or of auxiliary springs, while all the other properties of the spring can be deduced in analogy with the above.

One of the incidental conclusions which may be developed from the term DF is that the use of friction shock absorbers acting uniformly for compression as well as for extension is more rational than has usually lately been assumed, provided the vehicle springs to which they are applied come under the description: $DF = nL : (10 + m)$, with n smaller than needed for the range of the spring's work. The friction then protects the spring's working capacity while also adding to the value of T. But that an action better than uniform friction can be provided is perhaps equally plain.

Discussion on "The Improvement of Spring Systems"

Question Is Raised: Must Axles Be Turned Askew To Cushion One-Wheel Shocks Horizontally? And, If So, Is It Safe?

AMONG the conditions which have systematically been left over for separate consideration in the articles on The Improvement of Spring Systems, so as not to complicate the subject with constructive requirements at the outset, that relating to shocks which directly affect only one of a pair of wheels is perhaps the most important, because it occurs so frequently. It was briefly referred to in article VI in connection with the need of two universals on the driving shaft in case the axle is permitted to be turned in the horizontal plane by the action of such a shock on a horizontally acting spring. One of the engineers in the industry considers that the conceivable effects of one-sided shocks in turning the axles momentarily, if horizontal springing is used, are better looked into at once and sends the following communication:

Editor of THE AUTOMOBILE:—I have read your articles on Spring Suspensions with very great interest, especially those dealing with the necessity for cushioning the horizontal components of the road shocks. I have often in driving noted the effect of this lack of horizontal springing.

It is perfectly obvious, though I have never seen it stated in just this way, that, the greater the obstacle the greater is the horizontal component of its shock to the car, and with present spring suspensions the greater the horizontal component the less able is the car to cushion it.

Which means, the larger the obstacle, and the more a spring is needed, the less spring there is to work.

So the shock to the car would seem to increase as some function of the square of the height of the obstacle. And when the limit is reached and the obstacle is as high as the hub of the wheel, then, as the shock is purely horizontal, the ability to cushion it with present spring suspensions is zero. This last, of course, is only theoretical, but clearly shows the trend toward uselessness of the springs as the size of the obstacle increases, and the need of a spring becomes greater and greater.

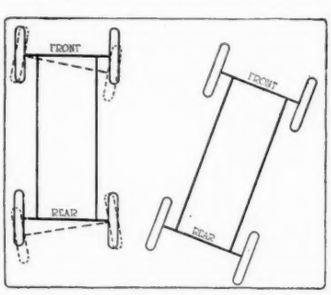
I believe, that a comprehensive study of the amount of energy lost under different conditions of wheel sizes and sizes of obstacles, and a plotting of the results might show some interesting facts, and I would like to see something like that published.

From actual experience, in common with most men who have driven cars much in rough country, I am thoroughly convinced of the great loss of energy due to the horizontal shocks. It is quite a common thing to have to shift to a lower gear for no other reason than striking a rock ledge or going through a chuck hole on a hill: the reduction in speed is generally quite noticeable, and though the hill often might be taken without shifting if it were smooth, the horizontal or backward shock received slows the car up enough to require the shift. This is a very easy thing for anyone to try by digging a chuck hole on a hill leaving room to go around it, so that the same hill and road conditions may be obtained with and without the chuck hole. With a chuck hole of sufficient size to give a good per cent. of horizontal shock, any one will soon become convinced, by this comparative test, that cushioning the horizontal shocks is of great importance from the standpoint of conservation of energy alone, even without considering comfort or the life of the car.

But there is one drawback which is very important and should be carefully considered; and that is the roadability of a car whose axles may move horizontally.

If both wheels strike an obstacle at the same instant the axle will move backwards and will stay square with the road, and no harm will be done.

But if only one wheel strikes an obstacle, that wheel alone will be retarded, and this will throw the axle out of square with the road, and if the car does not leave the road as a consequence, it will at least make steering very difficult.



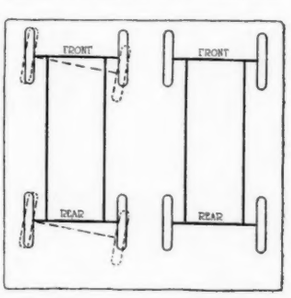


Fig. 1—Shock on right front wheel. Fig. 2—On right rear

And at high speeds it will probably be impossible to twist the wheel quick enough to keep the car running straight.

And what makes this condition all the worse is the fact that the retardation of one wheel on the front axle has the reverse effect to that produced by the retardation of one wheel on the rear axle.

An obstacle striking on the right front wheel will retard it, turn the axle slightly across the road and steer the car to the right—Fig. 1.

(*Continued on page* 599)

Sheet Steel for Motor Parts

New Able Engine for Small Cars Has Crankcase Bent Up from Single Piece—Other Unique Features

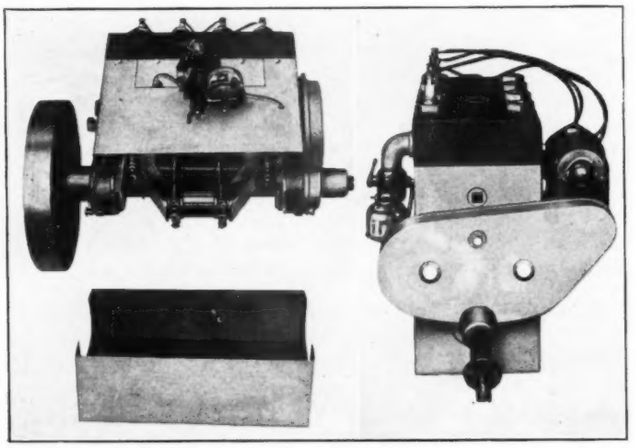


Fig. 1—Able light car motor showing crankshaft mounting

A NEW motor 2 5-8 inches bore and 4 inches stroke, with four cylinders has been prepared for manufacturing by the Able Motor Co., New York City, the basic idea of the design being to turn out an engine that will suit users who want small power for a very low price. Light weight has also been desired and a reasonable amount of power in proportion to the cylinder dimensions. Rated at 17 horsepower, we are informed that the power obtained from the first experimental motor has reached 22, which is moderately good for a piston displacement of 86 cubic inches.

Only One Heavy Piece

Everything has been done to eliminate work on the parts, and there is only one heavy piece, this being the cylinder block. This is shown in Fig. 1 and contains all the cast iron in the engine; in fact, there are only two other cast parts, barring the pistons. To support the two-bearing crankshaft, malleable brackets are bolted to the cylinders by a pair of bolts each, this being lighter and cheaper than casting hangers and cylinders in one piece—lighter because the malleable is stronger than plain cast iron, and cheaper because the machining of the cylinders and the hangers is rendered easier by the separation of parts.

Simple to Assemble

For the crank a drop forging in a good steel, with tensile strength of 80,000 pounds, is used and the two bearings are Hyatt rollers of the self-contained journal pattern. Each bearing is pushed on the crankshaft and the housing placed over it before the bolting to the cylinders takes place. Also the rear end bearing and hanger are mounted before the flywheel is put on, since the latter is merely a tight fit on the crank and is not held in any other way. The two camshafts are carried in the crankshaft hangers and assemble with the crank.

The illustrations make clear the way in which the whole of the crankcase is bent up from a single piece of sheet steel, with the oil trough pressed out in a separate piece pushed inside. The oil pump is a simple barrel containing a spring backed plunger, and since the barrel has a collar at the foot it has merely to be pushed up into the hole drilled for it in the cylinder foot, and the pressure of the actuating cam then keeps the barrel in place as well as holding up the plunger, thus eliminating any screws. Pressed sheet steel is used for the timing gear cover, the two pieces being overlapped just as the crankcase overlaps the cylinder block, and it is claimed that the width of the lap in each case is enough to retain all lubricant without any packing or gaskets.

There are only two thumb screws to secure the lower part of the crankcase, and the upper portion is held on by a small

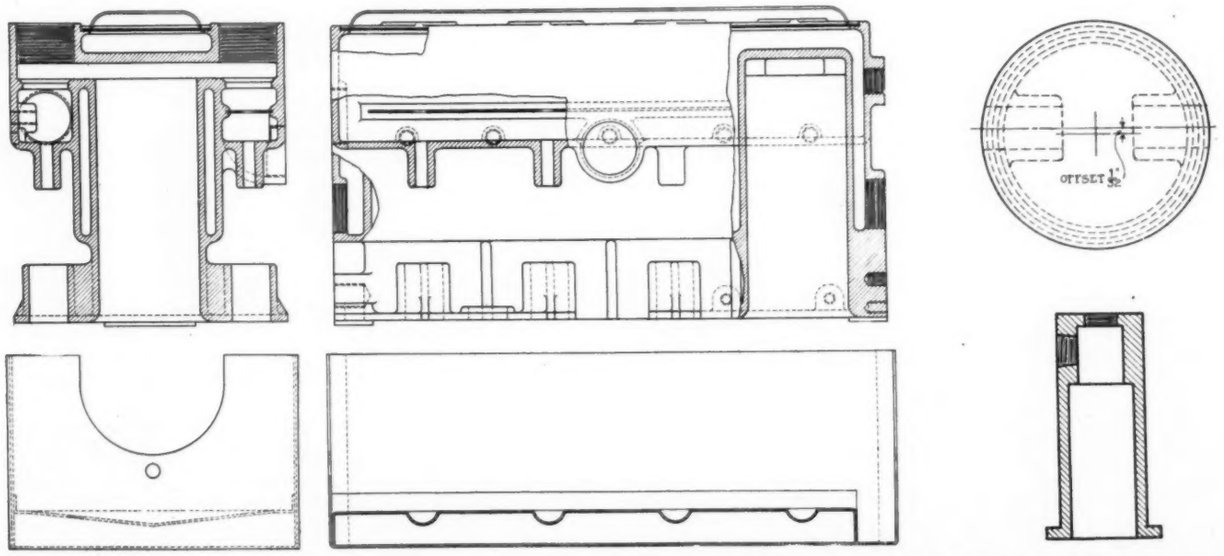


Fig. 2—Left—Sections of cylinder casting and sheet steel crankcase. Right—Plan of piston showing wristpin offset, and barrel of oil pump showing securing collar at base

number of screws, seen in the photographic illustration. For mounting the motor in the chassis, brackets of any kind can be bolted to either end of the cylinders. For ignition the standard fitting is a timer placed horizontally at the front end of one camshaft, but a special front hanger is made with an extra pinion carriage, so that a magneto can be mounted as shown.

There are light connecting-rods, and the pistons are also low in weight, while they have a feature claimed to eliminate slap. In the sketch of the piston head it can be seen that the wristpin is offset relative to the piston center line. This is done so that the explosion pressure may tend to tilt the piston in a direction opposite to that in which the angularity of the connecting-rod tries to force it.

A feature worthy of notice, though having little to do with the general scheme, is the intake arrangement. Referring to the drawing of the cylinders, the intake passage is divided horizontally by a steel plate which is cast in position, the ends of the plate are clear of the ends of the passage, the carbureter feeds to the middle of the passage, beneath the dividing plate, and the valve ports open to the passage above the plate. The effect is the provision of a continuous, or circulating, intake passage and the gas passes to the valves round either end of the plate. This construction gives a very short carbureter connection and provides a good body of well-warmed gas to draw from.

Another point of ingenuity is the way the top of the cylinders is filled in, the water head being pressed from sheet steel and dropped in place, after which solder is run round the edge and makes the top integral with the casting.

Rotary Valve Makes Slow Progress

Many Designs Have Been Tried, But Only One European Maker of Repute Now Uses Rotary Valve Motor as Standard

FOR many years past the patent office returns of every civilized country have shown that inventors in the automobile field have been fascinated greatly by the idea of rotary valve systems for motors. Rotary motion is always a better form than oscillating or reciprocating motion. Some day we shall have turbine—or truly rotary—automobile motors, but it is likely that rotary valve mechanisms will become usual long before the turbine ideal is attained. It is rather curious that considering the number of inventions, so little active progress has been made with rotary valves, for there is only one manufacturer in the world of any large reputation that has really taken up a rotary valve motor seriously, this being the Itala company of Turin, Italy. The motor used on their car has a single rotary valve serving each pair of cylinders and running at one-fourth crankshaft speed; it serves both intake and exhaust, is water cooled and well lubricated. There is no question but that this motor is a success but it is costly to make and the design is not very simple. Perhaps its good operation may be traced to the slow speed and ample cooling of the valve.

Darracq Rotary Abandoned

Another well known concern, which tried a rotary valve, only to abandon it afterwards, was the Darracq Co., but this motor was of a very different kind from the Itala, having a single barrel running lengthwise of the cylinders. The trouble with this was to keep it compression tight, and to prevent it cutting and scoring, while the motor never produced a power commensurate with its size.

In America probably the Mead motor has made most headway, this having two barrel valves, one on each side of the cylinders, controlling intake and exhaust respectively, but this engine has never been adopted by a firm making large quantities of cars so it is difficult to get a wide view of its effectiveness.

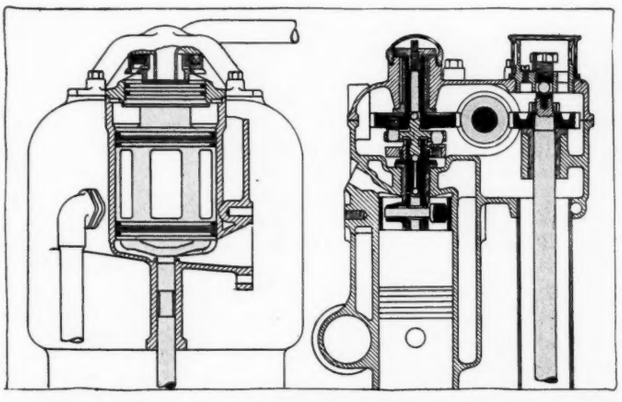
The most popular idea among rotary valve inventors is to use a barrel valve located above the cylinders somewhat after the fashion of the Bournonville motor described on page 1156 of THE AUTOMOBILE for December 24, 1914. In 1912 a small firm in Carlisle, England, claimed to have cornered the master patents for this class of gasoline engine. Since that time, however, nothing more has been heard of this claim so it is safe to assume that it was found to be incapable of being upheld.

A quite different kind of rotary mechanism was that expressed in the Renold motor which came from Detroit and had a flat disk located in each cylinder head; a port of segmental shape was cut in the valve and two such ports in the head of each cylinder. Apparently the trouble was that the disks only operated well when the motor pressures were light and the speed low. The motor was tried out in a six-cylinder form in a chassis by one of the big manufacturers in Detroit but it never appeared on any of his regular product.

French Designs Numerous

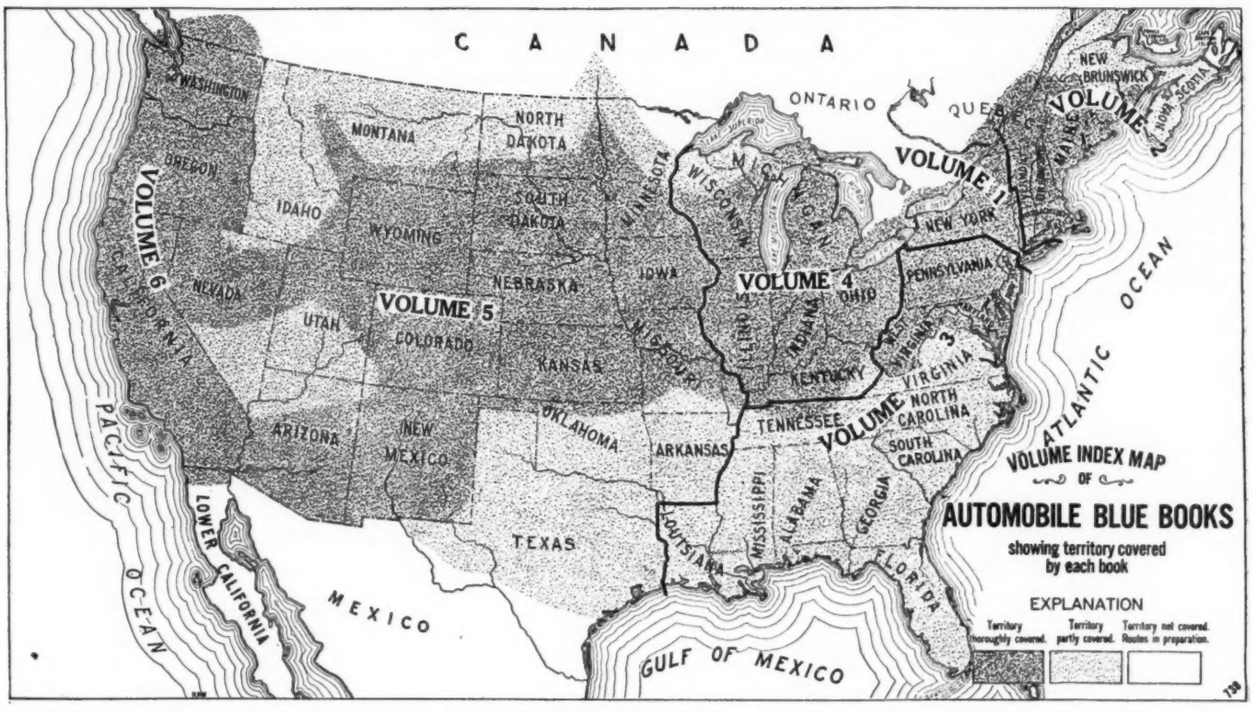
Yet another scheme was the French Cid motor which had a ring shaped valve in the cylinder head about 2 inches deep. This valve was shaped like a cuff and split like a piston ring so that its own natural expansion kept it tight pressed against the cylinder wall, and it had a port cut in it which registered with first an intake and then an exhaust port in the cylinder as the valve revolved. It was tried out for a long time and was to have been used in one of the 1913 races in France, but it never came to the starting line and its sponsors have never put it on the market.

French engineers seem to have been particularly keen on the rotary valve and for many years past each succeeding Paris show has revealed fresh attempts to solve the problem. It yet remains, however, for any one of these to make a big mark—even the Itala can hardly be said to have done that, and considering the progress made with other automobile problems, it does seem curious that the rotary valve is so long in making its way forward.



Left—Itala rotary valve which is the most successful commercially of all rotary types. It runs at quarter crankshaft speed and each valve serves both intake and exhaust for two adjacent cylinders. Right—The French C. I. D. motor as made originally and shown in Paris in 1910

Sixth Volume Added to Blue Books



Map showing how all parts of North America where automobile touring is possible are covered by the Automobile Blue Book

Covers California, Oregon, Washington and British Columbia—Entire Touring Area of United States Now Included

COMPLETING the survey of North America where touring is possible, a sixth volume, covering the states of California, Oregon and Washington and also the province of British Columbia, has been added to the edition of the Automobile Blue Book for 1915.

Another feature is the continuation and amplification of the Blue Book Touring Bureau, which was founded last year to meet the demands of an ever-increasing number of pleasure tourists. The Touring Bureau exceeded all expectations last year and looks for a greatly increased membership in 1915. It furnishes gratis to any Blue Book user all the varied kinds of information which he desires to amplify and supplement that contained in his Blue Book. This service has for years been rendered, in an individual way, by numerous enterprising automobile clubs scattered throughout the United States, but until 1914 no one association or organization has been able to make the service a nation-wide affair, largely owing to the fact that the expense of gathering the information, codifying and distributing it, would have rendered the cost prohibitive. The Automobile Blue Book Publishing Co. is, by the very nature of its organization, adequately equipped to render this service, and its endeavors in the past year, if continued on the same or larger scale, will easily double the intrinsic value of their publication, and so add largely to the pleasure of automobile touring.

War, Exposition and Good Roads Factors

Three factors—two of them new—contribute largely to the incentive which has made the publishers of the Blue Book expend unusual energy upon bringing the editorial matter to a state of perfection hitherto unattained. These factors are the war in Europe, which, by keeping Americans home, will naturally stimulate pleasure touring to a degree as yet unheard of; the California Expositions, whose lure will induce many motorists to attempt the transcontinental journey who never before had contemplated any such thing; and thirdly the culmination or completion of a year of the most extensive road work ever before attempted anywhere on the globe, which means a mileage of newly completed or newly improved highways such as no year in the past has ever seen accomplished.

The five older volumes divide the rest of the country in the customary way as follows: Volume 1—New York State and contiguous Canada; Volume 2—New England, Quebec and Maritime Provinces; Volume 3—New Jersey, Pennsylvania and the Southeast; Volume 4—The Middle West; Volume 5—The Mississippi River to the Pacific Coast.

Taking up the volumes in turn, we briefly summarize what we conceive to be the salient features of each.

New York and Canada—New Features

Volume 1—New York State and Canada. Upon opening this book the first thing that strikes the eye is a set of detailed maps covering the entire State of New York, maps on a scale so large—about 3 miles to the inch—that they may be used in conjunction with the route matter to an extent never before possible. It is, of course, impossible in a road guide dedicated to a survey of the trunk-lines in its particular territory to give a detailed description of all the many side-roads which may be suitable for automobile travel. The Empire State,

more than any other in the country, is blessed with a tremendous mileage of state, county and other highways, and the many millions of dollars which have been raised for the improvement of this network of roads have created and stimulated an amount of tourist travel quite out of proportion to the area of the state itself.

In addition to nearly 200 pages given over to this elaborate system of maps, one notices a comprehensive rearrangement of the route matter given in the text. So many new trunk-lines have been opened to traffic, and so extensive has been the relocation of the highways best suited to through travel, that the entire book seems to have been rewritten to meet changed conditions. A less important, though equally pleasing, feature of Volume 1 is the addition of numerous attractive photographs of beautiful scenery along the various highways.

New England—Pilot Maps Added

The six northeasternmost states of the Union have so long been famous for the excellence of their roads that very little change might be expected in Volume 2, describing New England. Yet here again the Blue Book has kept pace with the promised increase in touring by the inclusion of a complete set of detailed pilot maps, similar to those found in Volume 1. The stability which comes with age has, of course, made itself felt in New England, and few, if any, changes have been made in the route matter, but by the addition of these pilot maps hundreds upon hundreds of attractive side-trips, which limitation of space has hitherto prevented the publishers from including in the route matter, are now shown in graphic form, so that "he who runs may read." In Volume 2, also, the novel feature of the inclusion of photographic views adds greatly to the appearance of its twelve-hundred-odd pages.

West Virginia Added to Volume 3

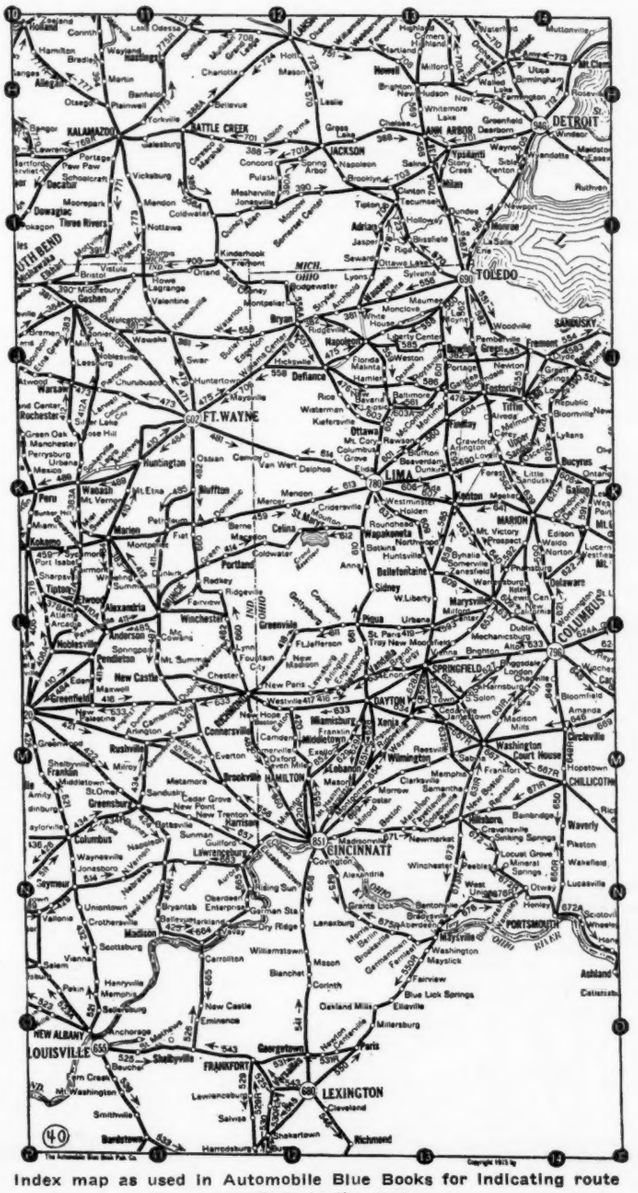
Most conspicuous of the changes in Volume 3, covering Pennsylvania and Maryland, is the inclusion of the State of West Virginia. Highway conditions in that mountainous state are, to be sure, not altogether perfect, but the authorities have at last waked up to the immeasurable benefits accruing from the stimulation of touring within their frontiers, and they are putting their house in order with a lively zest. Even where the roads are rough and hilly the superb scenery in the mountains will compensate one for the necessity of shifting gears and driving with circumspection. Nevertheless, there are several exceptionally good mountain roads leading across the state; one of the best of these starts from White Sulphur Springs and runs by way of Hot Springs and Monterey, Va., up through Elkins to Clarksburg and thence to Wheeling. This road traverses some of the most beautiful country to be found in the whole Appalachian chain, and the view from the top of Cheat Mountain is perhaps unsurpassed east of the Rockies. Another highway which will be found invaluable runs from Lexington, Va., through Covington to White Sulphur Springs, thence west along the valley of the Kanawha into Charleston, W. Va., from which point a good connection may be had to Portsmouth, O., or a fair dry-weather connection to Gallipolis—another Ohio town on the river of the same name.

Pennsylvania and Maryland Gain

Nowhere east of the Ohio River have road conditions improved with such giant strides as in the neighboring commonwealths of Pennsylvania and Maryland, and knowing this, the publishers of the Blue Book have strained every effort to cover as much territory in those two states as was possible during the summer and autumn of 1914. A number of very important through east and west trunk-lines have been included, among them the following: From Binghamton to Jamestown and Erie via the Southern Tier of New York State; an almost completely new highway from Harrisburg west to Pittsburgh by way of Altoona; and a brand new continuous thoroughfare from Baltimore to Pittsburgh by way of Bedford Springs; these, in addition to completely new surveys of the regular trunk-lines from Philadelphia to Pittsburgh via the Lancaster and Chambersburg Pikes, and from Baltimore to Wheeling via the Old National Road.

Perhaps the most important feature of highway construction in the territory embraced within the covers of Volume 3 is the practical completion of the Old National Road from tidewater at Baltimore to the Ohio River at Wheeling. This fine old national thoroughfare, which was originally started in 1808, or thereabouts, is now practically an uninterrupted line of macadam from the Maryland metropolis to Wheeling, where it connects with the state roads leading into all portions of the Buckeye State.

The addition of these many new continuous thoroughfares to the choice hitherto offered the tourist will make for the relieving of congestion along the several highways hitherto available for through traffic to and from the west. The traveler may now pick and choose from a copious selection of routes, each of which has its particular charms and advantages. This means a great advance in every respect, and will



Index map as used in Automobile Blue Books for indicating route numbers in the text

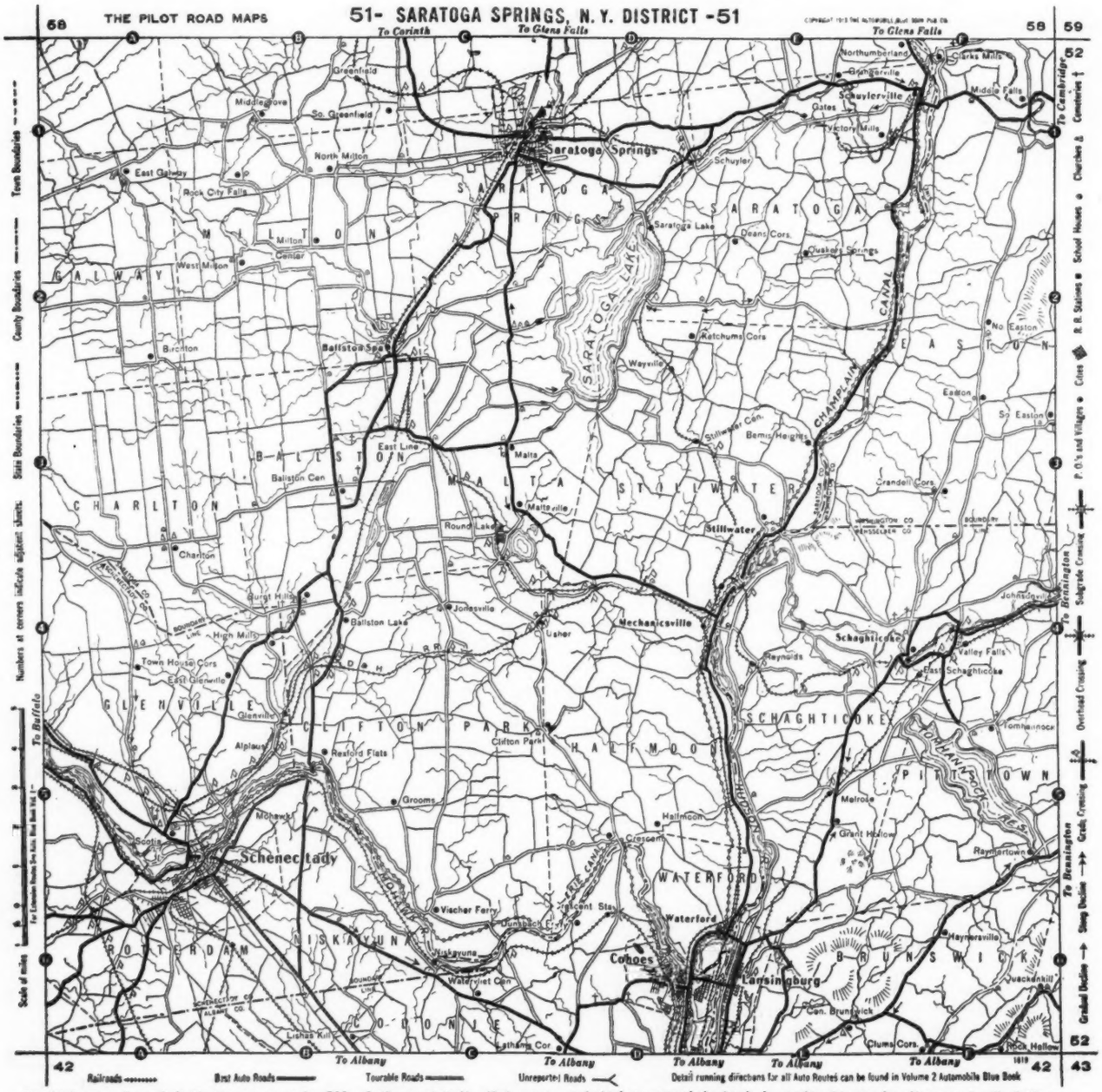
have the effect of stimulating automobile travel in this section of the country to an extent unthought of in the past.

Now that the value of improved roads is admitted generally it may seem of no particular significance to make this the keynote in speaking of the territory covered by Volume 4, namely, Illinois, Indiana, Kentucky, Michigan, Ohio and Wisconsin. Its importance is easily appreciated, however, when we remember that in five of the six states embraced in Volume 4 the present highway law for road improvement is only about 2 years old, which means that last summer the good results just began to make a real showing. To keep pace with this improvement the Blue Book cars were sent over every main line covering this territory gathering new road draftings and in addition adding numerous important connections not shown in any previous editions. Of the 58,000 miles of route directions shown in this volume 40,000 are given from absolutely new notes. All index maps are new and the territory covered by detail route maps materially extended.

By far the larger percentage of car owners living in the central states have been prone to believe that all the beautiful touring sections were in other states, but within the last year a constantly growing number began to appreciate that between the Ohio River and the Great Lakes are some of the most attractive spots in the United States. In these sections the Blue Book cars spent many weeks during the summer of 1914, especially in the beautiful lake districts of Michigan and Wisconsin and the hill country of the Ohio Valley. Road work was under way in all these parts, giving ample assurance of greatly improved conditions.

From the Mississippi to the Pacific

In view of the fact that the demand for route information on trips to the Coast this summer began early last year there was no alternative left the publishers in preparing for the 1915 edition. In order to prepare for the rush westward it was necessary to have two road surveyors in the Far West for over 3 months and every line of text on all the main transcontinental lines across the western territory was pro-



In Volumes 1 and 2 there are nearly 200 of these detail pilot maps printed on special stock in order to render it easy to find them

cured by them working separately between the middle of August and January 1. The work was prolonged in some sections until the snow in the mountains made further work impossible. Four complete and distinct routes between the Mississippi and the Coast were re-mapped, in addition to many short options, especially in the Rocky Mountain States, where the attractions of the Southwest with its historic and scenic interest vie with the grandeur of the snow-capped peaks, deep canyon roads and the magnificent glaciers of the higher peaks of the Rockies farther north.

The road improvement during the last year in the western states is truly phenomenal when one considers the relatively small population. In the West, however, every one is not only interested in good roads, but is working hard for them; and, what is of great importance to the tourist, most of them are anxious to increase the automobile tourist travel their way and have the traveler leave full of enthusiasm for the West, and, above all, for the particular section each one is interested in. This sort of spirit means not only the keenest kind of competition in road improvement but in the hospitality of the people; so it is safe to say that all motorists will receive a royal welcome in the West.

Discussion on "The Improvement of Spring Systems"

(*Continued from page* 593.)

An obstacle striking the right rear wheel will retard it, turn the axle slightly across the road, steering the rear of the car to the right; but as soon as the obstacle is passed and the retarded wheel again assumes its normal position the car will be steered to the left, as the front has not been turned off the road while the rear has gone to the right—Fig. 2.

Should it happen, as it most certainly would at times, that the right front wheel and the left rear wheel both strike obstacles at the same instant, the front of the car would be turned to the right and the rear of the car would go to the left till the obstacle was passed; then the entire car would be pointed to the right at just twice the angle that would be produced had only one wheel at a time been retarded—Fig. 3.

Should the right front wheel and the right rear wheel both strike obstacles at the same instant both right wheels would be retarded till the obstacle was passed, the car meantime moving sidewise; and when both axles have straightened up the car would still be pointed straight down the road, but it would be at one side of its original course—Fig. 4. This assumes that the obstacles have all been of the same size. But in actual road work this would of course seldom happen. All possible gradations would be met with, and all possible combinations.

A large obstacle striking the right front wheel at the same instant that a small one strikes the left rear wheel would result in the car going to the right less than if both were large obstacles, but more than if only the front obstacle were struck.

Different sized obstacles striking front and rear wheels on the same side would translate the car sidewise, but the end that struck the larger obstacle would go the farther from the road, so that when the axles straightened up the car would point to the right or left of its original course, depending upon which obstacle were the larger.

A different effect is obtained, in other words, from each different combination of obstacles, so that the readjustment of the steering wheel would have to depend upon each particular combination of obstacles.

At high speed it would be impossible to keep the car on a rough road and it would probably be a very hard job to do so on any ordinary road.

All this can probably be overcome, but it is well at the outset to recognize the importance of this problem of roadability if we are finally to have the horizontal road shock cushioned.

Detroit, March 24, 1915. W. M. E.

For the very high speeds which W. M. E. apparently has chiefly in mind, since it is the safety of the steering in which he is concerned, air tires are of course the preferable equipment at present, and they are likely to remain so the more rubber is developed into one of the large and staple crops of the tropics. And when air tires are used there is perhaps no need of turning the axle, even if they are supplemented by horizontal springing, as it may be preferable to guide the front end of the torsion tube (with a minimum of friction) to prevent such turning, thereby dividing the one-sided shock and forcing it to take effect on both sides. So far as commercial vehicles are concerned the writer is rather inclined to believe that, with their lower speeds, steering will remain safe enough even if the axles are turned somewhat, as a shock sharp enough to have a marked effect in this respect is also of very short duration, so that the axles return rapidly to the square position. The constructive complication arising from the need of protecting the ordinary vehicle springs from twisting looks more formidable to the writer, though it is taken care of in French cars in which the drive is taken through the springs. Until these constructive questions can be taken up more thoroughly, this and several other points on which opinion and judgment vary may perhaps be allowed to simmer. Meanwhile W. M. E. has placed it fairly before the public, and his statement that "all this can probably be overcome" is taken as an omen that he himself will contribute a solution in detail on the points on which he is in doubt.—M. C. K.

Volunteer Automobile Corps for Swedish Army

WHEN the Swedish army, shortly after the outbreak of the great war, was partly mobilized, the absence of a military automobile corps made itself keenly felt. As the news from the battlefields of Europe still further accentuated the great usefulness and importance of motor cars in warfare, some patriotic citizens of Stockholm undertook the organization of a Volunteer Automobile Corps. About fifty experienced motorists enlisted immediately, and the number has increased steadily, ever since. The enthusiasm for the project displayed all over the country has caused the establishment of branches of the corps in several other localities. It is expected that by April 1, when a general review is to be held, every army division will have as its adjunct one of these motor corps. Regular courses of instruction and drill practice will then commence.

One of the new organization's primary aims will be to promote the improvement of the Swedish roads and the building of new ones, principally with a view to military use, but also for the benefit of motorists in general. In this work the Volunteer Automobile Corps will co-operate with the Swedish Road Assn.

F. W. Taylor, Efficiency Expert, Dies

PHILADELPHIA, PA., March 26—Frederick Winslow Taylor, father of the Taylor system and originator of modern scientific management systems, died here Sunday from pneumonia. He was 59 years of age, a member of the American Society of Mechanical Engineers and was noted not only for his manufacturing systems but also for his numerous inventions and discoveries. One of the most noted of these is the Taylor-White method of treating modern high-speed tools. He was the author of many articles on scientific efficiency and installed his systems in many large industrial concerns, a number of which are devoted to the manufacture of automobiles.

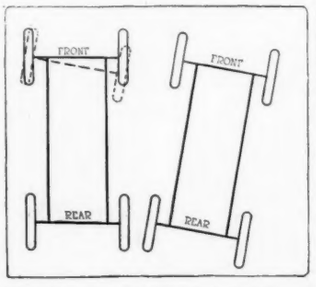


Fig. 3—On right front and left rear.

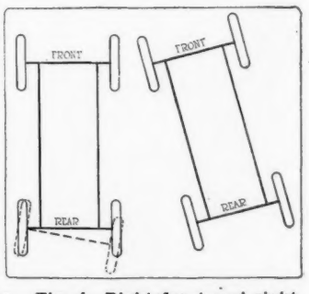


Fig. 4—Right front and right rear

The Automobile

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Imperative Efficiency

IT is a matter of efficiency or decline in these days of production, low cost and competition. A plant manufacturing a product in thousands must realize the necessity of a well-organized system yet there are many concerns that have failed to realize that the difficulties which they are encountering are due to internal sickness. They are between the Scylla of high manufacturing cost and the Charybdis of high prices. These concerns must realize that they can only do one of two things: They must either fall in line and submit their organization to the knife of the business surgeon or must take the other alternative—ultimate elimination.

The lesson must be brought home in every industry. It is not only common to the automobile, but in every field business men must realize that their concerns must be nearly 100 per cent. efficient if they will live. It is the money saved on production that creates dividends and what do we find as a result? The stocks of the high-efficiency, cheap-production concerns are soaring as never before. When a company finds that by writing seven orders in two writings it has replaced the work of writing seventeen separate orders in order to have the same work done, it is patent to that concern that something is wrong. If the time limit on a certain job can be cut from 43 minutes to 32 because the machine ran idle after finishing each job is it not better to increase the machine speed and put the $12,000 that would go for another machine into the pockets of the stockholders?

Obsolete methods must go. Unwieldy, haphazard production schemes form the rust that chokes the business machine. If it costs one house 30 cents to make an article that sells for 40 cents while another makes it for 20 and sells it for 30 cents, the answer as to which will survive is self-evident. This condition is not overdrawn. To exist a business must turn the X-ray upon its internal affairs and in their control make every hour worth a full 60 minutes.

The Jitney Necessity

TODAY the jitney movement is being more generally attacked than ever by the electric trolley interests, and unfortunately the sympathies of the public are being worked upon by the franchise argument. These attacks are striking home, in spite of the fact that our surface lines, our subways and our elevated lines are crowded to suffocation in the rush hours. What our city transportation systems require today is greater flexibility, which, in a measure, is possible with the jitney car and the jitney bus. Not only is jitney service much quicker than trolley service, but it offers a measure of flexibility, a condition which many of the old-world cities realized years ago when the motor bus was introduced and the trolley eliminated from restricted sections.

The public likes the jitney because it is quicker, often 10 to 12 minutes being saved on a 2-mile trip. The jitney movement, if it only relieves the inexcusable overcrowding of surface cars at rush hours, will have done a great good. It is up to the people, those who have to travel to and from work, to use their voice in seeing that plain justice is given the jitney movement in our various cities.

Tires in Storage

THERE are now thousands of motorists busy with their cars, getting ready to remove the dust of the garage to prepare for the far pleasanter dust of the road. Again and again these men have been urged to see to their tires before starting out on the first spring run, but the trouble seen on the road last Saturday and Sunday shows that there are still plenty of people who are satisfied to chance it. Rubber is stuff that is not really dead like steel; it grows stiff with the long winter rest and it needs a little getting back into form before it is put to work again. In almost every case the removal of the tires from a car that has stood all winter, even if it were on jacks, will disclose the inner tubes stuck to the casings, the rims slightly rusted and so on. Just taking off the tire, rubbing it well with chalk and repairing little cuts does not take long and it will save roadside delay sooner or later; also if there is a crack or unsuspected weak spot in the casing which means that the tire had better become a "spare" forthwith, then how much better to find it out comfortably at home than somewhere else when delay is inconvenience.

Metropolitan S.A.E. Reviews Boat Field

Differences in Practice Between Motor Boat and Automobile Construction—Little Standardization Possible in Boat Building

NEW YORK CITY, March 26—A motor boat evening was the feature of the monthly meeting of the Metropolitan Section of the Society of Automobile Engineers held here last night. An attendance of seventy members and guests showed that the interest of the automobile engineers in the twin field of motor boats is keen. The paper by C. F. Chapman, associate editor of Motor Boating, was entitled The Internal Combustion Engine in the Motor Boat.

Mr. Chapman gave an entire review of the motor boat industry in this country and brought out very clearly the reasons why the automobile engine cannot be directly substituted in a motor boat although most of the principles of construction apply to both. The primary reason that the automobile engine is not adapted for the motor boat is that in the latter it is required to run at full power all the time; in the automobile the motor only develops a small portion of its highest horsepower and it is only under conditions of extreme high speed, or hill climbing, that the maximum power is needed. Even at these times the maximum power is only required for a short time, whereas in motor boats the vessel is generally driven at its top speed from the moment that it leaves the dock until it returns.

Motor Boat Bearings More Rigid

This basic difference between the principle involved in motor boats and automobiles has resulted in numerous changes in the actual construction. For instance, in the crankshaft bearings of an automobile engine the minimum length and diameter is employed. In motor boat engines, on the other hand, the bearings are made much more rigid and crankshafts heavier to withstand the strains of continuous running at maximum power. Another great difference is that in the automobile there is a fan which draws the air through a radiator and hence aids considerably in cooling the motor by means of the forced gas. In the motor boat the engine is generally placed in some covered over portion of the boat far away from the cooling influence of a draught of wind and as a result the water jackets will have to be made larger to provide the added cooling effectiveness.

Salt Water Corrodes Jackets

The use of salt water in the cooling jackets of the motor boat engine causes corrosion of the metal. This is particularly true when the salt water becomes heated. This is a proposition which does not confront the automobile engine builder and hence furnishes another reason why automobile engine waterjackets are insufficient for motor boat practice. Another ill effect of salt water is the depositing of lime scale on the surface of the jackets, thus cutting down the cooling efficiency to a large degree. Besides these conditions there is no doubt but that the corrosive effect of the salt water on some of the zinc base die castings used for pump housings would be disastrous.

Little Standardization in Boat Industry

Mr. Chapman pointed out the great difference between the two industries as regards the output of the boat manufacturers and of the automobile manufacturers. He showed that whereas there are probably 300 or 400 representative passenger car manufacturers, at the very least there are more than 10,000 boat manufacturers. These builders of boats never know what engine is going to be placed in the boat that they are building until after they have received a definite order from the prospective owner; hence very little standardization is found in the motor boat industry.

Especially in the case of the builder of small two-cycle installations the different methods of handling the same problem are marked. For instance, if the buyer of the boat specifies a magneto the boat builder will hunt around and if he can find one in his shop he will put it in the box with the rest of the engine parts and attachments and ship it to the unfortunate buyer, leaving him to install it as best he may. Carbureter installations meet the same kind of rough treatment and, as a result, a startling lack of uniformity prevails throughout the industry.

Unusually Large Attendance

The meeting opened promptly at 8.30, and, according to previous announcements, closed at 10.30 p. m. sharp. As the paper took up practically the entire available 2 hours, discussion was short and, in fact, very little could be added to Mr. Chapman's comprehensive and well-illustrated paper. The departure from the more or less cut-and-dried topics brought out an unusually large attendance.

Houk Buys American Spoke Co. Plant

BUFFALO, N. Y., March 29—George W. Houk has purchased the plant of the American Spoke & Nipple Co., Detroit, Mich., for the Houk Mfg. Co., and will move all the machinery to the Buffalo plant. It has a capacity of 25,000 spokes and nipples per day. At the present time the Houk company is using 30,000 per day.

DETROIT, MICH., March 25—R. P. Spencer, who was one of the incorporators and director in charge of sales of the Denby Motor Truck Co., is no longer actively connected with that concern, but retains his stock holdings.

DETROIT, MICH., March 26—The first annual banquet of the Detroit section, Society of Automobile Engineers, was held yesterday evening at the Hotel Statler. There were 145 members present and W. H. Conant, formerly of New York and now acting secretary and treasurer of the local section, was toastmaster. He was introduced by E. T. Birdsall, chairman of the Detroit section. The speakers of the evening were Henry Souther, chairman of the membership committee of the S. A. E., who spoke on S. A. E., the Periscope of Automobiledom, and George W. Dunham, chief engineer of the Chalmers Motor Co., who spoke on The Automobile Engineer

Overland Orders Increase 1,300

Business from March 1 to 25 Exceeds Entire Record-Breaking Month of February

TOLEDO, O., March 29—Although February was the biggest month ever experienced by the Willys-Overland Co., up to that time the volume of business at the Toledo factory from March 1 to 25 exceeded that of the entire month of February.

Between March 1 and 25 more shipments were made than during the entire previous month and the number of orders received for cars exceeded those of February by more than 1,300. During this time orders for cars were received at the rate of 2,500 per week. The total number was exactly double that received during the same period of March, 1914.

In spite of the fact that more cars are being shipped daily from the Overland factory than ever before, orders have been showing a steady gain on shipments. In an effort to make the supply meet the demand the Overland plant is working at full capacity, employing 8,600 men and keeping many of the departments on a continuous 24 hour schedule.

On Monday, March 22, the first day following 7 weeks each of which was successively the largest in the history of the Overland company, 330 cars were shipped. The company first passed the 300-a-day mark just 5 weeks before.

J. I. Case 1914 Sales $14,395,384

RACINE, WIS., March 26—The largest gross sales in the history of the company are indicated by the annual reports of the J. I. Case T. M. Co., Racine, Wis., for the year 1914. The report, just issued, shows total sales of $14,395,384. Foreign sales amounted to $2,217,097 and domestic business was $12,178,286. The balance sheet does not enumerate the revenue from automobile business, but it is stated that it was an important factor and probably responsible for the decided increase. It is interesting to note that sales during the second half of 1914 exceeded those of the first 6 months, indicating a healthy improvement in business.

On December 1, 1914, the company redeemed and canceled $1,500,000 under the trust deed dated February 1, 1914, leaving $10,500,000 outstanding as of December 31, 1914. The high point of indebtedness on bonds and notes in the course of the year was reached July 5 with a total liability in bonds and notes of $16,785,000, liquidation of current assets being effected to the extent of $4,535,000 between that date and December 24, when the liability was reduced to its lowest point of the year, $12,250,000.

To Take Up General Motors Notes

NEW YORK CITY, March 31—Outstanding 6 per cent. first lien 5-year sinking fund gold notes of the General Motors Co., amounting to $7,852,000, and due October 1, will be redeemed at a price to yield 3 per cent. for the unexpired time. The price as of April 1, will be 101.455 and accrued interest; for April 15 it will be 101.342, and 101.213 for May 1. Payment will be made on presentation at the offices of J. W. Seligman & Co. and Lee, Higginson & Co.

These notes are the unredeemed part of a $15,000,000 issue. It was said that the management decided to pay them off at this time because of the liberal amount of cash in the treasury. After paying the notes, it was said, there would be remaining in the treasury between $6,000,000 and $7,000,000.

Kentucky Wagon to Build Hercules Cars

LOUISVILLE, KY., March 27—The Kentucky Wagon Mfg. Co., makers of the Urban and Old Hickory trucks, will immediately begin the manufacture of Hercules cars, an agreement to that effect having been made with the Hercules Sales Co., a new organization, which recently took over the patterns, blueprints, name of the car and output of Hercules Motor Car Co., New Albany, Ind.

The Hercules line consists of three models, a five-passenger touring car, $650; a roadster at the same price, and a town-car. The touring car formerly sold for $550 but a number of refinements and improvements, including the lengthening of the wheelbase from 104 to 110 inches and the addition of a gasoline tank, have been made.

The Hercules Sales Co. was organized January 12 with a capital stock of $100,000. Officers of the company are: A. H. Ross, Louisville, president; Charles Kelso, New Albany, vice-president; C. L. Caron, secretary and treasurer. W. E. Massey and J. R. Duffin, president of the Inter-Southern Life Insurance Co., both of Louisville, also are interested in the concern. No stock is for sale. The 400 agents of the Hercules Motor Car Co. will be supplied with cars by the Hercules Sales Co., which controls the selling rights of the Hercules car.

About 200 men will be added to the present working force of the Kentucky Wagon company. A lot of material and parts used in the manufacture of the Hercules which had been stored up in New Albany will be brought to Louisville immediately. About twenty-five cars a day will be the capacity at the start. According to President Ross, the output will later be increased to 100 cars a day.

Madison Motor Co. to Build 4 and 8

INDIANAPOLIS, IND., March 26—The Madison Motor Co., with plants at Anderson, Ind., and Berlin, Can., will be incorporated in the near future to manufacture a four-cylinder 30 horsepower car in the moderate-priced division, a car with a 112-inch wheelbase, that will market in the neighborhood of $750. It is also the intention of the company, beginning July 1, to build an eight-cylinder motor, preparations along these lines already having been taken.

Cecil Gibson, who has disposed of his interests in the Gibson Automobile Co. and the Empire Automobile Co., will assume the office of president and general manager of the company, which will be incorporated for $500,000. Associated with Mr. Gibson will be Henry Nyberg, W. E. Moore, C. F. Wood, of Washington, D. C., and Tom Forbes. Mr. Gibson is the largest stockholder.

New 7-Passenger Chandler Announced

NEW YORK CITY, March 29—A new touring model for seven passengers has been announced by the Chandler Motor Car Co., Cleveland, O., replacing the former five-passenger touring car, and, with a roadster built on the same chassis,

Market Reports for the Week

NEW YORK CITY, March 31—Market prices this week were generally steady. No changes occurred in the oils and lubricants market, while few occurred in the metals market. Tin was very erratic, its highest price being $54 per 100 pounds and its lowest $46. The closing price was $53 at a gain of $5. Both electrolytic and Lake coppers rose each $.00 3-8 a pound. Brass manufacturers continue to be the main sustaining force of the copper trade, and it is largely their purchases that cause a continued advance in the price of electrolytic and Lake copper here. Antimony is scarce and prices largely nominal around 21 cents a pound. In the rubber market offerings were light. Liberal arrivals of rubber were reported from Brazil, yesterday, but aside from this there was an absence of new developments as far as Fine Up-River is concerned. Scrap automobile rubber went down 1-4 cent.

Material	Wed.	Thurs.	Fri.	Sat.	Mon.	Tues.	Week's Changes
Antimony	.21½	.21½	.21½	.21½	.21½	.21½	.....
Beams & Channels, 100 lbs.	1.26	1.26	1.26	1.26	1.26	1.26	.....
Bessemer Steel, ton.	18.00	18.00	18.00	18.00	18.00	18.00	.....
Copper, Elec., lb.	.15¼	.15¼	.15⅜	.15⅜	.15⅜	.15⅝	+.00⅜
Copper, Lake, lb.	.15⅜	.15⅜	.15½	.15½	.15½	.15¾	+.00⅜
Cottonseed Oil, bbl.	6.55	6.57	6.55	6.55	6.65	6.60	+.05
Cyanide Potash, lb.	.21	.21	.21	.21	.21	.21	.....
Fish Oil, Menhaden, Brown	.41	.41	.41	.41	.41	.41	.....
Gasoline, Auto, bbl.	.12	.12	.12	.12	.12	.12	.....
Lard Oil, prime	.92	.92	.92	.92	.92	.92	.....
Lead, 100 lbs.	4.15	4.15	4.15	4.15	4.15	4.15	.....
Linseed Oil	.62	.62	.62	.62	.62	.62	.....
Open-Hearth Steel, ton	18.50	18.50	18.50	18.50	18.50	18.50	.....
Petroleum, bbl., Kans., crude	.40	.40	.40	.40	.40	.40	.....
Petroleum, bbl., Pa., crude	1.40	1.40	1.40	1.40	1.40	1.40	.....
Rapeseed Oil, refined.	.75	.75	.75	.75	.75	.75	.....
Rubber, Fine Up-River, Para	.58	.58	.58	.58	.58	.58	.....
Silk, raw, Ital.	..	3.90	..	..	3.90	3.90	.....
Silk, raw, Japan	..	3.50	..	..	3.55	3.52½	+.02½
Sulphuric Acid, 60 Baume	.90	.90	.90	.90	.90	.90	.....
Tin, 100 lb.	48.00	46.00	47.50	48.00	54.00	53.00	+5.00
Tire Scrap	.05	.05	.05	.05	.05	.04¾	—.00¼

forming the Chandler line. With either body the car sells for $1,295.

The new body has been made of ample size to accommodate its quota of passengers, and to accommodate it the wheelbase has been increased from 120 to 122 inches. There are two folding seats which, when not in use, fit snugly into recesses at the back of the front seat and are covered by flaps; when opened they are self-supporting and require no screws or other hand adjustments. There are no supports under them, which gives the maximum leg-room for the rear seat passengers.

Apart from lengthening, the chassis has undergone no change, the Chandler six-cylinder motor being used with L-head cylinders 3 3-8 by 5 cast in threes, Bosch magneto, Rayfield carbureter, Westinghouse starting-lighting, disk clutch, three-speed gearset, floating rear axle, left steer and center control and 34 by 4-inch tires.

—

ELMIRA, N. Y., March 26—The American-La France Fire Engine Co. has declared an initial dividend of 1 per cent. on its common stock, payable May 15 to stock of record May 10. The company also has declared the regular quarterly dividend of 1 3-4 per cent. on its preferred stock, payable April 1 to stock of record at the close today.

—

Gulf Co. To Test McAfee Process

AUSTIN, TEX., March 26—It is reported that the Gulf Refining Co. will build an oil refinery in Texas for the purpose of thoroughly testing the new McAfee process of extracting high grade oils from crude petroleum. Details of the new process have not as yet been given out but the reason given for the interest of the Gulf company is that the percentage of higher oils for a given quantity of crude is greatly increased.

The distilling of gasoline from natural gas promises to become a great industry in Texas. It is announced that the Magnolia Petroleum Co., the Texas Co., and the J. M. Duffy Petroleum Co. have under consideration the installing of large plants for this purpose. These companies are all operating in the natural gas districts of the state and claim yields of as high as 10 gallons of gasoline per 1,000 cubic feet of gas. Many of the natural gas wells have capacities ranging from 20,000,000 to 36,000,000 cubic feet per day, which will illustrate the possibilities of working this source on a large commercial scale.

—

INDIANAPOLIS, IND., March 27—The Cole Motor Co. has begun its eight-cylinder production and deliveries will start April 1. On April 15 the concern will run day and night shifts to properly take care of the orders.

—

Chicago To Have Half-Rate Taxicabs

CHICAGO, ILL., March 31—*Special Telegram*—Officers of the Walden W. Shaw Co. have announced the formation of the Yellow Cab Co., to operate taxicabs at 20 cents for the first mile, this being half the new legal rate determined by the city council Monday night when it reduced the standard charge from 50 to 40 cents for the first mile. The new company, which is incorporated for $100,000, will put in service at once 100 small cabs at all public stands to be operated at 20 cents for the first half-mile and 5 cents for each additional quarter mile. This will be in direct competition with the larger cabs of the Shaw company which will be operated on the new legal rate of 40 cents and 10 cents. The new cabs are only two-thirds as heavy as the present Shaw cab, have a four-passenger limousine body and 3 1-2-inch Continental motor; other features of the cars, which are built in the Shaw shops, are: thermo-syphon cooling, Bosch fixed ignition and Hotchkiss drive.

Automobile Securities Quotations

NEW YORK CITY, March 31—Strength and activity continued this week in the security quotations, especially in the tire and the automobile stocks. General Motors made a new high record, advancing 24 points to 124 and Maxwell Motors common, first and second preferred, advanced 4 1-2, 3, and 2 1-8 points respectively. International Motors stocks experienced a rise this week, the common gaining 6 1-2 points and the preferred, 14.

Kelly-Springfield Tire common was the strong feature of the curb market on March 29, advancing on vigorous buying to the new high of 122. The second preferred, which is convertible at par into common stock at any time within 10 years after July 1, 1914, was also higher, changing hands at 123. Goodyear common rose 5 points, while its preferred dropped 1 point. Goodrich common and preferred experienced fractional declines, the stocks, however, being quite steady. U. S. Rubber saw further gains this week when both its common and preferred went up 6 1-2 and 2 points respectively.

Several of the accessory securities gained, Aluminum Castings preferred rising 2 points and New Departure common and preferred, rising 6 and 1 points respectively. Texas oil stock rose 2 points.

In the Detroit Exchange, General Motors common showed the largest gain, that of 17 1-2 points. The automobile securities showed unusual strength, a majority of them showing substantial gains. Maxwell common and first preferred showed gains of 3 3-4 and 3 points respectively, while Packard common rose 2 points. Studebaker common gained 3 1-2 points and its preferred 1-2 point. Quotations from the inactive stocks show a large gain by the Canadian Ford, which rose 25 points. Kelsey Wheel stock rose 5 points.

	1914 Bid	1914 Asked	1915 Bid	1915 Asked	Net Ch'ges
Ajax-Grieb Rubber Co. com	200	..	285	..	..
Ajax-Grieb Rubber Co. pfd	98	102	100	..	
Aluminum Castings pfd	98	102	98	100	+2
J. I. Case pfd	..	..	78	82	..
Chalmers Motor Company com	77	†83	..	80	..
Chalmers Motor Company pfd	92	94	90	92½	—1½
Electric Storage Battery Co	..	..	49	50	..
Firestone Tire & Rubber Co. com	285	292	398	404	+2
Firestone Tire & Rubber Co. pfd	108	109	110	112	..
General Motors Company com	75½	77	124	125	+24
General Motors Company pfd	93½	94	99½	99¾	+ ½
B. F. Goodrich Company com	22	22½	36½	38	— ½
B. F. Goodrich Company pfd	86	88	96¾	98½	—1¼
Goodyear Tire & Rubber Co. com	175	180	195	198	+5
Goodyear Tire & Rubber Co. pfd	94	95	103½	104½	—1
Gray & Davis Inc. pfd	90	97	..	..	..
International Motor Co. com	..	5	8	..	+6½
International Motor Co. pfd	..	15	22	..	+14
Kelly-Springfield Tire Co. com	58	60	117	118	+5½
Kelly-Springfield Tire Co. 1st pfd	143	145	81	83	—2
Kelly-Springfield Tire Co. 2nd pfd	..	..	123	125	+5
Maxwell Motor Company com	7½	8	37	37½	+4½
Maxwell Motor Company 1st pfd	33	34	78	78¼	+3
Maxwell Motor Company 2nd pfd	11¾	12½	32⅛	33	+2⅛
Miller Rubber Company com	..	..	165	170	..
Miller Rubber Company pfd	..	..	101	103	..
New Departure Mfg. Co. com	..	..	134	135	+6
New Departure Mfg. Co. pfd	..	..	106	109	+1
Packard Motor Car Co. com	101	116	80	92	..
Packard Motor Car Co. pfd	95	98	93¾	97½	..
Peerless Motor Car Co. com	20	30	20	21	..
Peerless Motor Car Co. pfd	..	80	..	55	..
Portage Rubber Co. com	..	30	34	36	..
Portage Rubber Co. pfd	..	85	85	95	..
*Reo Motor Truck Company	7	8	11½	12	..
*Reo Motor Car Company	18¾	†19¼	28¼	29	— ¼
Splitdorf Electric Co. pfd	..	..	..	..	..
Stewart-Warner Speed. Corp. com	61½	62¼	57	59	+1
Stewart-Warner Speed. Corp. pfd	100	102	102½	105	+1
Studebaker Corporation com	30	31	51	52	+3
Studebaker Corporation pfd	85	86	93	95	—1
Swinehart Tire & Rubber Co	60	67	74½	76	..
Texas Company	..	..	134	135	+2
U. S. Rubber Co. com	61½	62	64	65	+6½
U. S. Rubber Co. pfd	103½	104½	105	106	+2
Vacuum Oil Company	..	..	..	..	..
White Company pfd	107	110	103	108	..
Willys-Overland Co. com	64	66	120½	121½	+2½
Willys-Overland Co. pfd	89	94	99	101	..

*Par value $10; all others $100 par value.
†Ex-dividend.

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

ACTIVE STOCKS

	1914 Bid	1914 Asked	1915 Bid	1915 Asked	Net Ch'ges
Chalmers Motor Co. com	..	83	..	80	—1
Chalmers Motor Co. pfd	90	94	90	92½	..
Continental Motor Co. com	150	..	165	185	..
Continental Motor Co. pfd	..	75	80	85	..
General Motors Co. com	73	76½	123	127	+17½
General Motors Co. pfd	93	95	99	100½	+ ½
Maxwell Motor Co. com	6½	7½	35½	37	+3¾
Maxwell Motor Co. 1st pfd	32	34	77	79	+3
Maxwell Motor Co. 2d pfd	11	12¼	32	33½	+1
Packard Motor Car Co. com	102	116	80	92	+2
Packard Motor Car Co. pfd	94	98	93¾	97½	..
*Reo Motor Car Co	19½	19¾	28¾	29½	+ ¾
*Reo Motor Truck Co	7⅜	8½	11	12	— ⅛
Studebaker Corporation com	..	..	50	52	+3½
Studebaker Corporation pfd	..	..	93	95	+ ½

INACTIVE STOCKS

*Atlas Drop Forge Co	21	..	25	..	..
Ford Motor Co. of Canada	540	560	550	..	+25
Kelsey Wheel Co	190	200	195	..	+5
*W. K. Prudden Co	..	21	18¾	20½	— ⅛
Regal Motor Car Co. pfd	..	45	..	25	..

BONDS

General Motors, notes 6s, 1915	98	100	100⅜	100¾	..
Packard Motor Co. 5s, 1916	..	98	95	..	..

*Par value $10; all others $100 par value.

February Exports $4,807,812

1,502 Trucks Valued at $3,022,482 and 2,230 Cars Worth $1,785,330 Shipped —Nearly 100% Gain Over 1914

WASHINGTON, D. C., March 30—February exports show that 1,502 trucks, valued at $3,022,482, as against fifty-seven, valued at $83,461 in 1914, and 2,230 passenger cars, valued at $1,785,330, as against 2,837 in 1914, worth $2,378,494, were shipped abroad. During the 8 months' period ending February, the exports of trucks increased from 493 valued at $797,722 in 1914, to 4,974, valued at $14,411,924 in 1915. The passenger car exports decreased from 16,390, valued at $14,919,487 in 1914, to 9,134, valued at $7,593,429 in 1915.

The figures show that, while truck exports are increasing at a tremendous rate, the passenger car exports are rapidly declining on account of a possible lack of transportation facilities.

New Aluminum Alloy for Pistons

LOS ANGELES, CAL., March 24—A new aluminum alloy for pistons has been brought out by Harry A. Miller, inventor of the Master carbureter, under the name of Alloyanum. This material is stated to be a good bearing metal and has a specific gravity of 3.532 or about one-half that of cast iron. The tensile strength on the other hand is given as 49,600 pounds to the square inch which is more than double that of good cast iron. It is stated that the Peugeot driven by Dario Resta in the Vanderbilt cup and Grand Prize event was equipped with pistons of this material. Other drivers, including Bob Burman, Eddie Pullen and Louis Disbrow are stated to be using the new alloy. Miller worked out this alloy while getting up a light metal for a carbureter for aviation work. It has the characteristics of aluminum alloys in that it is strong, light and a good conductor of heat. Figures on the coefficient of expansion of the metal are not as yet available.

Firestone Adds Tire for Electrics

NEW YORK CITY, March 26—A new tire designed especially for use on electric pleasure cars has been developed by the Firestone Tire & Rubber Co., Akron, O., and was recently placed on the market.

The new pneumatic is built up with unusually heavy gum cushions between the layers of fabric to provide a high degree of resiliency; the construction is worked out with a view to obtaining the greatest possible economy of power, and the makers state that the result has been very satisfactory. But one type of tread is used—the Firestone dual tread, in which there is a central depression between two raised sections.

The prices, in some of the more popular electric car sizes, are as follows: 34 by 4, $34; 34 by 4 1-2, $40; 36 by 4 1-2, $43.

U-S-L To Sell Assets and Reorganize in July

NIAGARA FALLS, N. Y., March 30—The U. S. Light & Heating Co., which has been operated under a receivership since last July, was authorized today to sell its assets, by an order from Judge Hazel of the Federal court, on the motion of Adolph Rebadow of Buffalo, counsel for the receivers of the company. No opposition was offered to the granting of the motion. The sale of assets will not take place until July when a reorganization of the company will be effected, when it is expected that those interested in the reorganization will purchase the assets.

The assets of the concern, including bills and accounts receivable, amount to $2,507,672.84, the total indebtedness being put at $754,602.47. J. Allan Smith, president of the firm, was appointed co-receiver with James O. Moore and James A. Roberts in February.

Pass Thorn Bill for Advance Payments

NEW YORK CITY, March 31—Presumably to meet the objection that the method of making payments under the New York Workmen's Compensation Law without the use of the Compensation Commission as an intermediary would result in considerable delays, both the Senate and Assembly have passed the Thorn bill, which provides for advance payments. It is expected that in a few days Governor Whitman will sign this measure as well as the previous measure, which makes direct payments by the employer to the employee possible.

The Thorn bill is intended to compel employers to make payments to injured workmen immediately after an agreement has been entered into and before injury claims have been officially passed by the Commission. Furthermore, the bill would permit employers to make advance payments even though no agreement had been entered into, such awards to be credited to any award which the commission might later decide upon. If it should develop that the employee were entitled to no compensation, however, the State would make no effort to assist the employer in recovering his advance.

Puritan Machine Buys Krit Parts

DETROIT, MICH., March 27—Large quantities of the assets of the defunct Krit Motor Car Co., and the Krit Motor Sales Co. were purchased by the Puritan Machine Co. at auction last week. The Puritan company will continue the manufacture of parts for the Krit and will also build a limited number of complete cars. This makes something like sixty different makes of cars, no longer manufactured, for which the Puritan Machine Co. furnishes parts.

BOSTON, MASS., March 29—The offer in writing made by the joint stockholders' committee for the property of the Walpole Tire & Rubber Co. was filed in the United States district court today by the receiver. The offer states that in accordance with trust agreements on file with the State Street Trust Co., the Federal Trust Co. and the American Trust Co., the committee in the event of a resale of the property being ordered by the court, will bid not less than $800,000 for it.

Owing to the fact that the receivers' and creditors' committee which purchased the property for $780,000 had not been able to agree on the terms of the decree of sale, the hearing on the confirmation of the sale set for 2 p. m. today was postponed until April 5.

Warren Creditors Receive Final Dividend

DETROIT, MICH., March 29—The liquidation of the affairs of the bankrupt Warren Motor Car Co. ended a few days ago and a final report has been mailed to the creditors and stockholders by the Detroit Trust Co., which acted as receiver. A final dividend of 2 1-8 per cent. was allowed paid by the court and is being sent now. The total dividend paid to the creditors is 22 1-8 per cent.

A rather unusual feature was that, while the appraised value of the assets of the company was $119,000, exclusive of mortgages, the receipts of the receiver, since its appointment, from liquidation of the various assets have amounted to $165,947.27 showing that $46,947.27 more had been obtained than at first estimated. Of this amount about $40,000 was spent to pay taxes and clear title to the company's real estate.

Speedwell Creditors May Get 10 Per Cent.

TOLEDO, O., March 26—Provided the proposition for a settlement of the affairs of the Speedwell Motor Car Co., Dayton, O., by means of liquidation outside of the courts, is accepted by all the interests concerned, general merchandise creditors of the company may get as much as 10 cents on the dollar on their claims.

Receiver Green has been authorized by the court to borrow $10,000 to repair certain parts of the factory and to properly guard it until it is again placed in operation. The merchandise claims total about $63,000.

It is considered probable that the Recording and Computing Machines Co., Dayton, of which W. I. Ohmer is president, will purchase or lease the plant of the Speedwell company. It is reported that the plant was offered for $150,000, the face value of the property, which is carried on the books for something over $200,000. It is also stated that the bondholders have likewise made a proposition to lease the plant to Mr. Ohmer on his assuming the interest on the bonds.

40 Cents per H. P. in California Bill

SACRAMENTO, CAL., March 26—Annual state automobile license fees will be paid at the rate of 40 cents a horsepower under the conference automobile bill, introduced in the senate today by Senator Birdsall. Among its features are: that license plates need not be changed each year, but a small

disk will be attached indicating the year. That speeders on a second conviction shall lose their licenses for 6 months.

One of the chief contests in the drafting of the bill was settled with the fixing of the S. A. E. formula for rating horsepower.

The tax on commercial vehicles is changed so that they are rated according to weight of the unloaded car, ranging from $5 up to 4,000 pounds to $20 for 8,000 or more pounds.

All automobiles formerly exempted from license fees, except Federal-owned cars, are included under the tax. Municipally-owned cars are the principal ones affected.

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TRENTON, N. J., March 24—The House today passed the Senate bill amending the Seven Sisters anti-trust laws by permitting a corporation to buy the stock of another corporation for investment purposes, but not for voting power.

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N. Y. Bill Gives Cities License Power

NEW YORK CITY, March 31—An automobile bill was introduced at Albany last week by Dwight Braman, president of the Law and Order League, which would amend the present automobile law by providing for the licensing of automobiles by the first class cities of New York, Buffalo and Rochester. All funds, however, are to go to the state. These city licenses will be good anywhere in the state and state licenses are to be good in the first-class cities.

Clero Hand-Operated Horn Reduced to $3.50

NEW HAVEN, CONN., March 27—The Fitzgerald Mfg. Co., Torrington, Conn., has reduced the price of its regular type hand-operated warning signal, the Clero, from $4.50 to $3.50. At the same time the price of the extra long projector has been reduced from $5 to $4. The regular model is finished in black with nickel bell and the extra long projector has black finish with the rim of the bell nickeled.

Both signals are of the type in which the operating lever is vertical, the signal being operated by pushing the levers down. Attachment is simple.

Clero hand horn selling for $3.50

Morton Receives $270,000 Truck Order

HARRISBURG, PA., March 27—An order for ninety-four commercial trucks for the British government at a possible cost of $270,000 was announced this week by Ross Morton of the Morton Truck and Tractor Co., following the receipt of a cablegram from R. L. Morton, who is now in London demonstrating with two armored trucks manufactured at the Harrisburg plant.

Work on the order will be started within the next 2 weeks and will provide for employment of additional men at the plant. The work will be started as soon as the contract for the machines is received. While they are being built work will be carried on day and night.

This is the second big contract received by this firm from the British government within the past month. The work on the trucks for the British government and the large tractor order for the Russian government will keep the plant busy for a number of months to come.

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Duplex Enters Foreign Fields

CHARLOTTE, MICH., March 24—An order for 375 trucks has been received by the Duplex Power Car Co., of this city. These trucks have been sold to an exporting concern located in London, Paris, Petrograd, Buenos Aires, Johannesburg, South Africa, and points in Australia, Japan and China.

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ST. PAUL, MINN., March 20—An order for thirty four-wheel-driven Ware trucks has just been received by the Ware Motor Vehicle Co. of this city. The trucks are for military service abroad and the price paid is said to be $3,500 apiece.

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NEW YORK CITY, March 24—It is reported on good authority here today that the Bowling Green Motor Car Co., Bowling Green, O., has received an order for 1,000 trucks from the Wolseley Motors, Ltd., Birmingham, England, for military service.

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DETROIT, MICH., March 30—J. C. Ayers, who has been in charge of the Detroit branch of the General Motors Truck Co., will become assistant sales manager at the factory in Pontiac. The Detroit factory branch will be discontinued April 1 when the sale of G. M. C. trucks will be taken over by the Standard Auto Co., which also has secured the agency for Republic trucks.

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SEATTLE, WASH., March 27—A trainload of Case automobiles consigned to Vladivostok arrived in this city, last week, the same being part of a large order placed with the J. I. Case Co., by the Russian Government.

This trainload is the second consignment which has come through the port of Seattle bound for Siberia during the past month. Considerable secrecy surrounds this shipment, but it is estimated by the Case distributors in Seattle, Messrs. Sharp and Leader, that it contains approximately 168 automobiles. On each of the twenty-one flat cars are two boxes containing the parts for probably eight machines each. The value of the shipment is about $250,000.

The machines will be shipped from Seattle to Vladivostok on the Russian boat now making this port, and will be reshipped from there to Eastern Russia. Upon their arrival in Petrograd, they will be uncrated and assembled by a skilled crew of Case factory expert mechanics.

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Duplex and Jeffery in Government Test

WASHINGTON, D. C., March 27—Before a board of officers of the army and marine corps a series of demonstrations was conducted this week with a 2-ton Duplex and a 1 1-2-ton Jeffery truck, both carrying 20 per cent. overload. The testing ground was in lower Potomac Park and the trucks were equipped with chains. The Duplex was the first to cross the field and had gone about 100 yards when the rear wheels began to sink down into the soft earth. Holes were dug around the wheels and as soon as suitable traction had been secured the truck pulled out of the holes under its own power.

The Jeffery truck was sent at good speed across the same field and, while turning, the rear wheels sunk out of sight while the front wheels went almost down to the hubs. The greater portion of the load of pig iron was removed and after traction had been secured the truck quickly extricated itself. Later demonstrations were conducted at Fort Myer in connection with the field artillery. The board conducting the tests consisted of Col. E. K. Cole, Maj. Robert Dunlop, Maj. H. L. Roosevelt and Capt. Robert Underwood. They have not yet completed their report of the tests.

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LIMA, O., March 26—A new 500-pound light delivery vehicle is to be manufactured in this city by C. E. Miller and F. M. McGraw. The new vehicle is listed at $550, weighs 1,350 pounds and is provided with a 20-horsepower four-cylinder valve-in-the-head motor. Mr. McGraw was formerly a buyer for the McIntyre Mfg. Co., Auburn, Ind.

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NEW YORK CITY, March 30—Invitations to attend the motor truck convention in Detroit on May 5 and 6 have been sent by the National Automobile Chamber of Commerce to all the active established manufacturers of commercial motor vehicles.

Arrangements for the convention were made last week by M. L. Pulcher, Wm. E. Metzger and Alfred Reeves. Get-acquainted buffet luncheons will be served each day in the banquet hall of the Statler hotel, and there will be an entertainment for convention delegates the first night. Among the papers to be read will be one on Advantages of Selling on Time Payments and How Such Sales Should Be Handled, by Windsor T. White, president of the White Co., and chairman of the Commercial Vehicle Committee of the N. A. C. C.

Street Railways Fight Jitney Development

Activity in New Bus Lines—Many Organizations

BOSTON, MASS., March 27—How the street railway interests of Massachusetts tried to legislate the jitneys out of existence just as they were born in the Bay State makes an interesting story. The Massachusetts Street Railway Assn. had received reports of the jitneys, and quietly went to work to stop them by filing a bill in the legislature last January, that for completeness was far ahead of anything the motor interests had ever seen.

The bill had so much in it that it was top heavy, and it was seen right away that it was an attack upon the jitney bus. But as many members of the legislature came from sections where the street railways gave no service or very poor service the committee on Mercantile Affairs was waiting for the street railway attorneys with "a brick in each hand." And the motorists were there to put in their side. The apparent attempt to legislate out of existence a transportation plan that had not even had a chance did not appeal to the members of the committee. There was also before it another bill with the same idea in view though not so bad, that called for depositing $3,000 in securities before anyone could operate a motor vehicle for hire. That was sent to roads and bridges committee where it was quickly thrown out and a new bill of very different character reported.

It contains only five sections. The first section does not say who shall or shall not engage in the business. It provides for first securing a permit from the municipal or town authorities, and the filing of a bond of $2,000 for each vehicle operated. Section 2 provides that persons injured may have action against such bond. Section 3 allows the city and town authorities to make special rules for the convenience and safety of the public. Section 4 provides a penalty of not more than $20 for violating the law. The new law goes into effect July 1, and does not apply to taxicabs, motor cars rented by the day or hour, with or without driver, or to motor vehicles performing a service similar to that performed by horse-drawn vehicles.

To Fight Texas Jitney Laws

AUSTIN, TEX., March 26—Several of the Texas towns have under consideration ordinances regulating the jitney transportation service. In Fort Worth and Houston ordinances that are alleged to be particularly drastic have been adopted. The constitutionality of the Fort Worth ordinance is to be tested in the courts. The case that is expected to determine to a more or less degree the standing of the jitney is that of ex parte I. W. Sullivan. Under the Fort Worth ordinance Sullivan was fined $10 annual tax for the privilege of operating a jitney car upon the streets of that city. He has taken an appeal to the State court of criminal appeals and the case was formally submitted to that tribunal on March 31. It is expected a decision will be handed down in a short time. The attorneys for Mr. Sullivan allege on his behalf that the ordinance is unconstitutional because it is class legislation, inasmuch as it fixes a tax on operators of jitneys in excess of that levied on hacks and buses, which is $3 per annum.

The Houston jitney ordinance requires a bond of $5,000, with one-half that sum as the maximum amount of recovery in case of injury. Jitneys are forbidden to pass street cars while the latter are taking on or discharging passengers. The ordinance also provides a license fee for each jitney and contains several other drastic provisions which are objected to by the operators of the cars. The measure will be tested in the courts, it is announced.

The two principal objectionable features of the Dallas jitney ordinance from the standpoint of the operators are that which requires them each to give a bond of $2,500 as a protection to passengers in case of injury and the one that prohibits them from carrying passengers on the running board of their cars.

Second New York City Jitney Application

NEW YORK CITY, March 25—The New York Central Transportation Co., Inc., has applied to the Board of Estimate and Apportionment for a franchise to operate a 5-cent bus line between the Grand Central and Pennsylvania railroad stations in this city. The only buses now running to and from the Pennsylvania terminal are those of the Fifth Avenue Coach Co., on which the fare is 10 cents.

The bus company offers to pay the city 3 per cent. of the net profits or 20 per cent. of the gross receipts for a franchise.

The People's 5-cent Bus Corp. also has an application before the board for a franchise to operate electric buses over certain of the city streets for a 5-cent fare which has not been acted upon as yet.

Chicago Considering Municipal Buses

CHICAGO, ILL., March 31—Plans to establish a system of motor buses in this city to be owned and operated by it, have been made. Commissioner of Public Service has made preliminary report to the city council favoring the project and designating twelve suitable routes together with estimates of the number of buses needed and the cost of installation.

If the city decides to adopt the buses, it will use for the purpose a fund of $3,000,000 derived from the city's share of the earnings of the traction companies, which are strongly opposed to the plan.

Baltimore-Washington Bus Line Planned

WASHINGTON, D. C., March 27—Application has been made to the public utilities commission by the Baltimore & Washington Boulevard Co. to operate a motor bus line between this city and Baltimore.

The proposed route is over the so-called Washington-Baltimore boulevard, a distance of 45 miles. Terminals will be established in the heart of the two cities and it is proposed to charge a fare of 75 cents each way. This is much lower than the fare charged by either the steam railroads or the electric line. It is proposed to operate 40-horsepower buses having a capacity for twenty-six passengers each and weighing 7,500 pounds. Management of the company will be by a board of directors consisting of J. M. Lehman, C. E. Trace, E. A. Reiner, F. J. Kenney, W. H. Laynor and F. B. Manns. It is expected the service will be inaugurated within the next 6 weeks.

SAN FRANCISCO, CAL., March 26—The San Francisco Jitney Bus Assn. has been in existence for about 2 months. It has 1,400 members already and is growing daily. A point of interest is that while the competition is the trolley system of the city, whether privately or municipally owned, the association does not run any jitneys upon the same street on which the municipal cars operate, rather selecting where possible a parallel route. The Pacific Coast Casualty Co. makes a special rate to them of $72 per year, payable $6 a month. This is equivalent to a bond and protects them against any accident.

Jitney Convention at Kansas City May 4

KANSAS CITY, MO., March 26—Kansas City jitney people have called for a national convention of all those interested in the jitney movement to be held in this city, May 4, 5 and 6 at which time an interchange of views on such points as legislation, insurance, safety in operation, licensing of drivers, equipment and every other question relative to the jitney movement can be discussed. The call for the convention has resulted from the many letters the Kansas City Jitney Assn., 1133 Grand avenue, has received.

SPRINGFIELD, MASS., March 27—The Studebaker agency in this city has started a jitney bus line between Carew street and Forest park during the rush hours, morning and night, and a 20-minute service for a 5-cent fare is in force. The bus in use carries twelve passengers and others with a larger capacity will be used later if business warrants it. This makes the second jitney bus line in Springfield.

PROVIDENCE, R. I., March 26—Two wagon loads of police in addition to the four on duty were needed to keep order at the City Hall last night when a hearing was given on plans to originate ordinances to govern the running of jitney buses in Providence. It was estimated that 1,500 people besieged

the hall. The council chamber, lobbies, coatrooms and balconies were packed and several hundred more could not get in and had to stand in the hallways on the second and third floors and the broad staircases. Another large number could not get into the building at all. The hearing was overwhelmingly in favor of jitneys, of which 500 are in operation here.

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NEW YORK CITY, March 29—The eighth annual Winton Motor Car Co. repair expense contest will start May 1 and end October 30. Cash prizes amounting to $3,500 will be paid the twenty-five chauffeurs making the best records. Also, the best record made by a "New-Size" six will win for its owner a brand-new car in even exchange for his old one.

If prior to October 30 any contestant has driven 12,500 miles, his effort ends at that point; he will not be required to continue. This is to equalize chances. First prize will be $500; second, $400; third, $300; and fourth, $200. Sixteen prizes of $100 each and five district prizes of $100 each will be awarded. District prizes will be awarded for the best remaining record in each of five sections, after the first twenty prizes have been awarded.

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National Garage Assn. Holds Convention

CHICAGO, ILL., March 25—The National Garage Owners' Assn. met in its annual convention March 23 and 24 at the Great Northern hotel. About 150 members were present representing the 1,250 garages which belong to the association in sixteen different states. The first Tuesday in October was set as the date for the Fall meeting.

W. N. Mitchell, chairman of the purchasing bureau of the association, aroused enthusiasm by his report of the success of the bureau in buying the oil supplies for the association direct from the refiners. Since January 1 all the oil sold by members of the association has been bought through this bureau at a considerable reduction over the prices which it has been necessary to pay previously.

Supplies of all sorts also are being purchased by the Central Bureau direct from the manufacturers at a distinct saving to the garage owners, through the fact that the bureau can obtain quantity rates on supplies which would not be available for the individual garageman. The object of this arrangement is to assist the garagemen in competing with the mail order houses.

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Pacific Racing Assn. Organized

LOS ANGELES, CAL., March 29—*Special Telegram*—The Pacific Racing Assn. was organized here today and made formal application for affiliation with the Automobile Club of Southern California. The ostensible object of the association is the sanctioning and controlling of automobile racing in Southern California. This organization comes as an aftermath of the recent controversy in connection with racing on the coast. Up to the present time the Automobile Club of Southern California has enjoyed special privileges from the American Automobile Assn. Contest Board for the conducting of its own contests, but these were recently withdrawn, after which the club severed its affiliations with the A. A. A. and hence the new organization.

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Two Sunbeam Racers for Chicago Meet

CHICAGO, ILL., March 29—A cable direct from the Sunbeam company of England nominates two cars for the Chicago speedway race, scheduled for June 19, the drivers named being Louis Coatalen, engineer of the company, and Porporato, a Spanish driver who at one time was considered among the top-notchers but who has not been very active in racing of late years. Inasmuch at Coatalen and Chassagne have been named for the Indianapolis race, fans are wondering if a switch in plans has been made and Porporato substituted for the holder of the world's hour record, who is now in the French army.

Coatalen promises to bring over two of the Sunbeams which were raced in the last French Grand Priz, stating that these cars really are racers whereas the Sunbeams that have been in American competition have been modified types of touring cars.

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NEW YORK CITY, March 29—The Finley Robertson Porter Co., Port Jefferson, L. I., states that the three Porter-Knights which are being built for the 500-mile race at Indianapolis will be on the road by May 10. Good progress is being made in the construction of the motors and it is expected that the first one will be put on the block this week.

Mr. Porter has selected his drivers and he states that his pilots will be Hughey Hughes, Neil Whalen and Bruce Keene.

Tacoma Speedway to Be Planked

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Track 50 Feet Wide—Asphalt Coating to Prevent Skidding—Other Racing News

TACOMA, WASH., March 25—Plans were adopted at a meeting of the directors of the Tacoma Speedway Assn. to make Tacoma's automobile speedway the fastest in the world. Wooden planks will be laid on the entire track, reducing resistance to a minimum and giving an amount of elasticity not found on dirt tracks. The planks will be covered with asphalt.

The question of plank pavement was taken up with the foremost drivers of the world by both George Dunn and I. N. Hague on their recent trip to San Francisco, and it was the opinion of the drivers that planks would make not only the fastest but the safest track.

Specifications call for the planks to be laid on edge at a width of 50 feet for the entire course. These planks will be laid with a space of 3-8 of an inch between them so that the present dish of the track will be maintained. A coating of asphalt will be given the surface to prevent the danger of cars skidding. The work of planking and surfacing the track will be completed by June 1.

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International Motor Contest Assn. Formed

NEW YORK, March 31—The International Motor Contest Assn. has been organized and incorporated by the interests controlling State Fairs throughout the country for the purpose of conducting automobile races on mile and half-mile dirt tracks. This association intends to issue its own rules concerning races on these tracks, issue sanctions and, in general, to conduct such events.

This action was not unexpected by the American Automobile Assn. Contest Board which at present controls automobile racing, as some of the dirt track associations have been itching under the stringent regulations required by the Contest Board. The real cause of the present action dates to the placing of the Michigan State Fair track in the suspended list for conducting unsanctioned cyclecar races July 4, 1914, and the secretary of the Michigan State Fair Assn. is the leading mover in the new organization. Richard Kennerdell, Chairman of the Contest Board of the American Automobile Assn., does not view the new rival organization as a menace to properly organized and conducted automobile contests. The Contest Board has had stringent rules governing dirt track races requiring the removing of the fences at curves, removal of top rails, elimination of dust, and the proper safeguarding of spectators and contestants. Tracks have been required to register annually at a nominal fee and the Contest Board has been insistent in having its representatives at the various meets in order to insure enforcement of the rules.

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Burman-Disbrow-Cooper Match Race

LOS ANGELES, CAL., March 24—Bob Burman, Louis Disbrow and Earl Cooper are to meet on the famous Ascot Park 1-mile dirt track in a three-cornered match race, April 4. Disbrow, driver of the Simplex Zip and Burman, pilot of the Peugeot, signed articles yesterday afternoon. Earl Cooper heard of the match race this morning and at once issued a challenge to the two drivers. Both Burman and Disbrow were willing to have Cooper and his Stutz admitted to the competition and the three-cornered race was immediately framed. The race will be sanctioned by the A. A. A. and promoted by Walter Hemple, who is hanging up a $3,000 purse on a winner-take-all basis.

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INDIANAPOLIS, IND., March 29—The appointment of B. H. Miller of Indianapolis to superintend the construction of the automobile speedway at Sheepshead Bay, L. I., has been announced and Mr. Miller is now in the east, ready to begin work.

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INDIANAPOLIS, IND., March 29—Under the auspices of the Business Men's Assn. of the city, a slow race for automobiles will be held at Alexandria, Ind., on April 14. Any car stopping or changing gears during the race will be disqualified.

Factory Miscellany

FRANKLIN'S Three-Story Addition—Plans are being prepared for a three-story addition to the plant of the H. H. Franklin Mfg. Co., Syracuse, N. Y., to be 100 feet in Gifford street and 53 feet deep. The construction work will cost $25,000 and the equipment of the building will bring the total expenditure up to $40,000. The structure will be used for the manufacture of die castings, this branch of the Franklin industry having outgrown its present quarters. Work will be started as early in April as it is possible. It will be so constructed that it can be enlarged at any time with little difficulty. The building is to be of fireproof construction, steel, concrete and brick being used. The Franklin factory reports an increase of sales since February 15 of 48 per cent. over the same period last year, while for the past 2 weeks the increase is 96 per cent.

Allen to Build—The Allen Motor Co. is contemplating the erection of a one-story $10,000 factory at Bethlehem, Pa.

Mayer Carbureter's New Plant—The Mayer Carbureter Co., 2673 Main street, Buffalo, will build a factory at Main and Amherst streets.

Packard's Storage Building—The Packard Motor Car Co., Detroit, Mich., is planning the erection of a 60 by 400-foot building for the storage of assembled parts.

Reo Working Full Time—Factories of the Reo Motor Car Co., Lansing, Mich., are working night and day, and the volume of business is running double that of a year ago.

To Build Bodies—It is reported that the Cruse-Crawford Mfg. Co., Birmingham, Ala., will establish a plant for the manufacture of automobile tops and wagon and buggy bodies.

Doehler Castings to Build—The Doehler Die Castings Co., Toledo, O., is having plans prepared for a factory containing 60,000 square feet of floor space. It will be located at the City Boulevard and Lake Shore Railroad.

Hoover Ball Adds—The Hoover Steel Ball Co., Ann Arbor, Mich., will erect a new factory building, 256 by 60 feet, which is now in course of construction. When completed there will be 230 men on the company's payroll as against less than ninety in 1913.

Start Work on Grant Plant—The Grant Motor Co., Findlay, O., has already commenced using the auxiliary plant in South Findlay that it recently leased. The chassis will be built in the North Findlay plant and the cars completed at the South Side plant.

Tire Plant for Mt. Clemens—The Auto Tire Armor Co., Mt. Clemens, Mich., has been incorporated with $10,000 capital stock to manufacture automobile tires. A factory has been purchased and equipment will be installed at once. Jay Baldwin and A. A. Bennett are the principal stockholders.

Willard Moves to Chippewa Falls—The Willard Mfg. Co. of Minneapolis, Minn., manufacturing electrical devices and specialties, is moving its plant and equipment to Chippewa Falls, Wis., which city has been selected as a permanent home. The name of the company will be changed to Chippewa-Willard Mfg. Co.

The Automobile Calendar

Mar. 30-April 2	Johnstown, Pa., Show, The Auditorium.
April	Calumet, Mich., Show, Coliseum.
April 3	Paterson, N. J., Show, Auditorium, R. A. Mitchell.
April 4	Los Angeles, Cal., Track Race.
April 5-10	DuBois, Pa., Show, Moose Hall.
April 7-10	Calumet, Mich., Show, Coliseum Rink.
April 16	Manchester, Eng., Show, Ice Palace, North of England Motor Shows, Ltd.
April 20-22	Oklahoma City, Okla. Road Race, S. W. Auto Racing Assn.
May 15-16	Columbus, O., Track Race, Columbus Automobile Club.
May 17-18	Boston, Mass., A. A. A. Annual Meeting.
May 27	Chicago, Ill., Sociability Run of Chicago Motor Club to South Bend, Ind. H. H. Robinson.
May 29	Indianapolis, Ind., 500-Mile Race, Indianapolis Motor Speedway.
June 9	Galesburg, Ill., 200-Mile Race, Galesburg District Fair Assn.
June 19	Chicago, Ill., 500-Mile Race, Chicago Speedway.
July 3	Sioux City, Ia., 300-Mile Race, Sioux City Speedway Assn.
July 4-5	Tacoma, Wash., Road Race.
July 5	Omaha, Neb., Speedway Races, Omaha Motor Speedway.
Aug	Milwaukee, Wis., Independent Petroleum Marketers' Assn. of the U. S.; 1915 Convention in Milwaukee.
Aug. 2-3	San Francisco, Cal., Tri-State Good Roads Assn., Third Annual Convention.
Aug. 20-21	Elgin, Ill., Road Race.
Sept.	Indianapolis, Ind., Fall Show, Indiana State Fair.
Sept. 20-25	San Francisco, Cal., International Engineering Congress.
Oct. 6-16	New York City, Ninth Electrical Exposition and Motor Show at Grand Central Palace.

Roberts Brass Establishes Foundry—The Roberts Brass Co., Milwaukee, Wis., organized recently, has established a brass foundry and machine shop in the large factory building at 249-251 Lake street, and will manufacture an extensive line of brass specialties and parts for motor cars and railing, tubing, valves, etc.

Brown & Sharpe to Increase—The Brown & Sharpe Mfg. Co., Providence, R. I., has awarded the contract for greatly increasing its building known as No. 5. This structure is 49 by 146 feet, two stories high. Four additional stories will be built to bring it to the six-story addition, 64 by 109 feet, the estimated cost of which will be $75,000.

Cornelian's Production Schedule—The Blood Bros. Machine Co., Allegan, Mich., has laid out a production schedule which will enable it to build twenty-five Cornelian cars in April, 125 in May and 200 in June. The company has orders on file which will keep the shops going for many months. The working force will be gradually increased, this depending principally upon getting all the needed new machinery in place.

Regal Gives Second Motor Order.—The second contract for 1,000 motors for the Regal Motor Car Co., Detroit, Mich., has been received by the Port Huron Construction Co., Port Huron, Mich. The first order was given several weeks ago and was for 1,000 light, small, four-cylinder motors. The new order is for 1,000 eight-cylinder power plants. Both motors were designed by S. G. Jenks, general manager of the local company.

A. O. Smith Busy—The A. O. Smith Co., Milwaukee, Wis., pressed steel frames and parts, is again operating its big plant at full capacity, the number of employees on March 27 having reached more than 1,200. According to C. S. Smith, vice-president, business is brisk and the company's customers are making larger purchases than for a long time. Mr. Smith anticipates a maintenance of this demand throughout the summer and fall.

Studebaker Adds Machinery—A battery of new cylinder lapping machines has been installed in the plant of the Studebaker Corp., South Bend, Ind. These machines are just like those used for lapping the four-cylinder motors, except that each machine completes the work of one entire cylinder block of six cylinders in one operation. The block of cylinders is clamped on the machine upside down, and a set of master pistons of exact size work rapidly up and down in the cylinders. By keeping this up for several hours the cylinders become very accurate and are broken in.

Tank Co. Increases—Owing to the increase in business, David Israel, 300 West 48th street, New York City, engaged in the manufacture of gasoline tanks and fenders for the trade, has been compelled to take additional quarters for the manufacture of his line. This additional floor space will take in a stock room and a store room. The present working capacity of this concern is fifty tanks per day. When all alterations are completed the capacity will run anywhere from 100 to 150 tanks per day. This concern at the present time is building tanks for the Chevrolet cars and is prepared to take additional work from car manufacturers.

Auto-Light Co. in G. E. Plant—The Electric Auto-Lite Co., Toledo, O., will occupy the General Electric Co. plant on Champlain street, that city. The lease of the buildings is taken by the Willys-Overland Co., which subleases to the lamp company. There are two buildings, the larger one 304 by 85 feet, and four stories high. This will be used for manufacturing purposes while the other plant will be used for offices and the engineering department. An additional building will be erected for the press department. The company now occupies the old Dow & Snell building at the west end of the Cherry street bridge, affording 100,000 square feet of working space. The capacity of the present plant is 500 parts a day. The combined capacity of the two plants will be 1,200 pieces daily. Contracts have been signed which insure a daily output of 800 parts after August 1.

The Week in the Industry

Motor Men in New Roles

SPANISH Rep. Wants Accessories—In order to investigate American automobile manufacturing methods and equipment, as well as to effect selling arrangements for automobile parts and accessories, J. M. Vallet, representative of important Spanish automobile interests, is at present in this country and contemplates a tour of inspection. His headquarters are with Manuel Caragel & Son, 127 Water street, New York City.

Morehouse Resigns from Hudson—A. Morehouse has resigned as assistant chief engineer of the Hudson Motor Car Co., Detroit, Mich.

Sullivan Heads Overland Agency—A. P. Sullivan becomes head of the Overland Sales Co., Houston, Tex., C. W. Lindsay, former manager, having retired.

Histed Case N. Y. Mgr.—J. R. Histed has succeeded O. A. Lewellen as branch house manager for the New York City territory of the J. I. Case T. M. Co.

Smith Russel Axle Sales Mgr.—E. L. Smith, former Western representative of the R. I. V. Co., has been appointed sales manager of the Russel Motor Axle Co., North Detroit, Mich.

McDuffie Resigns—H. McDuffie has severed his connections with the Wm. R. Ruess Co., Los Angeles, and joined the forces of the J. W. Leavitt Co., coast distributors for the Overland.

Babcock Master Carbureter Agent—George Babcock, driver of one of the English Sunbeams in the recent Corona races, has returned to Hartford, Conn., and will represent the Master carbureter there.

Bowen Saxon Mgr.—The Saxon Motor Sales Co., Columbus, O., has been organized with C. N. Bowen as manager, located at 138 East Spring street, Columbus, O., to handle the Saxon and Hillier in central Ohio territory.

Dilger Advanced—A. C. Dilger has been advanced from the parts order department of the Studebaker Corp.'s factory at Detroit, Mich., to take charge of parts and claims at the New York City branch, effective April 1.

M. Siegfried King Production Mgr.—J. B. Siegfried, who until now had the title of purchasing agent of the King Motor Car Co., Detroit, Mich., has been appointed production manager and superintendent of purchases.

Hayes in Racine—H. T. Hayes, manager of the Mitchel Motor Co., Dallas, Tex., has been transferred to Racine, Wis., where he will look after the marketing of Mitchel automobiles in all states west of the Mississippi River.

Mahoney Chandler's Publicity Mgr.—J. J. Mahoney, press agent for the Boston Automobile Shows, has accepted a position with the Nettleton-Crittenden Co., Boston, Mass., New England distributors of Chandler cars, to act as publicity man.

Wells Transferred to Baltimore—C. E. Wells, former manager of the automobile department of the John Deere Plow Co., Dallas, Tex., has been transferred to Baltimore, where he becomes manager of the Baltimore house of the John Deere Co.

Markee District Manager—F. D. Markee has been appointed district manager of the New England branch of the Mitchell Motor Car Co., of New York, and will make his headquarters with F. H. Lucas, who has the Mitchell line in Boston, Mass.

Whaley Heads New Haven Chevrolet—J. H. Whaley, head salesman of the Hartford Buick Co., Hartford, Conn., has severed his connection with that concern and has been appointed manager of the New Haven Chevrolet branch. He assumed his new duties April 1.

Everett Resigns from Mitchell—W. W. Everett, for the past 8½ years in charge of the repair department for the Mitchell-Lewis Motor Co., Racine, Wis., has resigned to take a position as sales manager for the Racine branch of the Wisconsin Gas & Elec. Co.

Prewitt Resigns—J. L. Prewitt, for several years connected with the Chalmers and Palmer-Singer factories and for the past 2 years sales manager for J. W. Mason, Newark, N. J., has resigned to open a wholesale and retail automobile supply store to be known as the Essex Auto Supply, at 453 Main street, East Orange, N. J.

Andress Chase Division Mgr.—H. D. Andress, until recently in charge of transportation problems for the Pennsylvania Railroad, has been appointed division manager for the Chase Motor Truck Co., Syracuse, N. Y., in a territory including Ohio, Indiana, Kentucky and part of West Virginia. He has established his headquarters in Cleveland, O.

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Garage and Dealers' Field

Republic Tire Moves—The Republic Tire Co., Grand Rapids, Mich., has moved to 44 Murray Building.

Lippard-Stewart Makes Lease—The Lippard-Stewart Motor Sales Co., New York City, has leased a store at 136 to 146 West 52d street.

Gets Wire Wheel Agency—F. S. Boyd, who handles accessories in Boston, Mass., has taken on the agency for Rudge-Whitworth wire wheels.

Detroit Supply Co. Moves—The United States Auto Supply Co. has moved from 182 Grand River avenue, Detroit, Mich., to 851 Woodward avenue.

Auto Spray Offices Moved—The offices of the Auto Spray Co. have been moved from 86 East Lafayette avenue, Detroit, Mich., to 1231 Woodward avenue.

Takes Saginaw Empire Tire Agency—The Popp & Wolf Hardware Co., Saginaw, Mich., has taken the agency for northern Michigan for the Empire tires.

Firestone's New Branch—The Firestone Tire and Rubber Co. has opened a branch house in East Dallas, Tex. This company now has three houses in Dallas.

Silver Makes Newark Lease—The C. T. Silver Motor Car Co., of New York City, has leased a store at 738 Broad street, Newark, N. J. The store has a frontage of 35 feet.

Michelin Branch in Des Moines—R. B. Tracy, general manager for the Michelin Tire Co., Milltown, N. J., has opened a branch at 1109 Walnut street, Des Moines, Ia.

Overland Agency Installs Paint Dept.—An automobile paint department has been installed at the Grand Rapids, Mich., headquarters of the Grand Rapids Overland Co., with service manager R. Richards in charge.

Opens New Salesroom—The Paige-Detroit Co., of New York City, has opened a Broadway salesroom at 63d street and Broadway. The new store will be run in addition to the general headquarters of the Paige company, in 58th street, just east of Broadway.

Mitchell Opens Detroit Station.—H. A. Mitchell, who was chief engineer of the Krit Motor Car Co., has opened a service station at 940 Jefferson avenue, East, Detroit, Mich. Krit car owners will find there a complete stock of parts for the different Krit models.

Fire Destroys Fifty Cars—Fire on March 27 in the building of the Collings Carriage and Auto Body Co., Camden, N. J., caused a damage of $150,000. Fifty automobiles, valued at $100,000, are included in the loss. Fifty cars on the first floor, ready for delivery, were saved.

New Detroit Accessory Firm—Automobile accessories are being handled by the Advance Sales Co., Detroit, Mich., which recently opened for business at 864 Woodward avenue. This company was formed by W. F. Nick and J. J. Grady, both formerly connected with the Maxwell Motor Co.

Montreal Dealers Form Assn.—The accessories dealers in Montreal, Que., are forming a protective association in conjunction with the parent association, the Montreal Automobile Trade Assn., to regulate the prices of accessories. The sale of accessories has assumed the nature of an abuse latterly and it has long been felt that stringent steps should be taken to protect the trade.

Newark's Automobile Pageant—The Newark (N. J.) automobile dealers will have an automobile pageant on April 10. The parade is to be made up of six sections, including passenger cars, municipal vehicles, commercial cars, motorcycles and floats. Prizes consisting of silver cups, trophies and accessories are offered in the various divisions. Headquarters are 845 Broad street, in care of C. E. Holgate, secretary.

In New Quarters—A. M. Spear, Jr., agent for the Dodge cars at Portland, Me., has moved into the old Spear Auto Co. quarters, 92 Cross street. C. E. Hill, manager of the King agency at Portland, has opened the new salesrooms at 17 Forest avenue, where the car is being handled through the Cape Cottage Garage Company. The United States Tire Co. has opened a branch at Portland, at 16 Forest avenue, to serve all Maine, Coos County, N. H., and Essex County, Vt. The Kelly-Springfield Tire Co. has closed an agency with M. B. Mank.

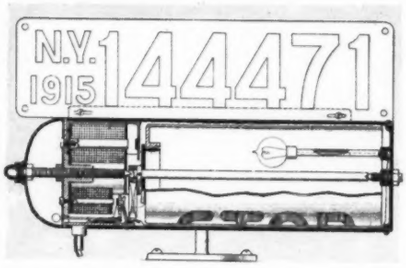
ACCESSORIES

Direction Indicator

THE external appearance of this device is made clear by the photograph, which also shows its size, by comparison with the standard number plate. The outer case is brass, and inside there is a glass cylinder divided into four sections, one bearing the word "Stop," another colored plain red, and the other two labelled "Turn," bearing arrows pointing to right and left respectively. At the end of the case there are three magnets which can be caused to pull around an armature and turn the glass cylinder more or less according to which magnet is energized. In the section this armature is shown hanging in the bottom position, to which it returns by gravity when the magnets are de-energized. The lamp is accessible from the end of the case, and there is a long, narrow window along the top of the case through which a shaft of light illuminates the registration plate.

It is recommended that the control be both by finger-operated switch and by connection to the brake pedal for bringing the "Stop" signal into play. Normally, when there is no current in any magnet and the armature lies at the bottom, it is the plain red section of the glass cylinder that is opposite the rear window, and this acts as a tail light. A bell forms the left end of the outer case, as can be seen in the cut, and this is arranged to ring every time the signal is operated.—Samuel T. Warner, New York City.

Exterior of Warner rear signal



Warner signal in section, showing construction and scheme of magnets

Combined Horn Button and Dimmer

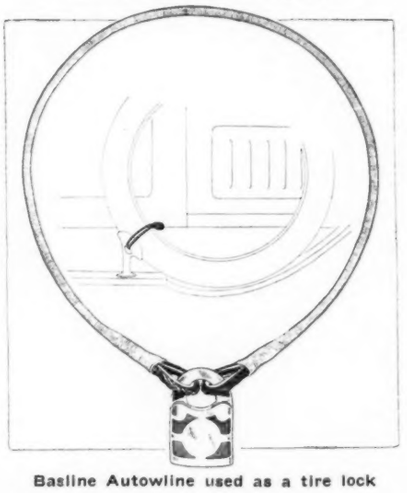
This little fitting is designed to take the place of the ordinary horn button and is suitable for attachment to any convenient place. In the center is the usual button which operates the horn in the ordinary manner, and a second knob which can be slid across in a concealed slot is situated beside the middle button. A slide forward puts on the lamps bright, and pulling the knob backwards and to the left throws in the dimming coil. One more wire is called for than is needed by an ordinary horn push, and the switch is catalogued at $3.—Kent Electric Co., Grand Rapids, Mich.

Gearset Lock

There is no more effective way of locking a car than by rendering it impossible to engage a gear. The Commercial lock is a specially designed padlock which hooks into the center of the change speed gate and is secured there by a turn of the key. It is made to suit thirty-seven different makes of car and possesses the advantage that it needs no fitting whatever; just put it in place and turn the key. It is sold by the makers for $2, and they claim that the lock cannot be broken while in position.—Commercial Mfg. Co., Cleveland, O.

Towing Line and Car Lock

Every long-distance tourist knows the Basline Autowline that coils up small and yet will pull any car, for it is the sort of aid to getting out from bad places that just suits the needs of the case. The makers have just applied the same material for locking a car or for attaching spare tires in such a way that they cannot be removed. It is claimed that the strength of the Basline strands is such that no ordinary nippers can cut through them, the eyes are spliced in a way which makes it very difficult to attack that part of the device, and the lock itself is a strong bronze casting. Price is $2. The line is covered with a special fabric, which, it is claimed, will not fray or collect dirt.—Broderick & Bascom Rope Co., St. Louis, Mo.



Basline Autowline used as a tire lock

Unbreakable Ammeter

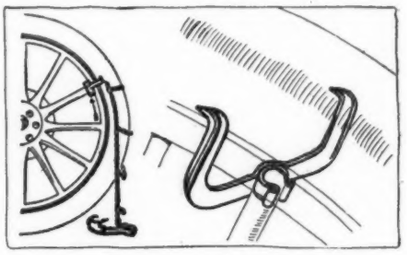
This pocket meter is all metal and contains no delicate parts or glass, so it can be thrown in amongst a jumbled tool kit without fear. The bottom point is insulated by a plug of ebonite, completely protected by the outer case and the second terminal can be removed by sliding off the clip. The only care necessary is to hold the meter upright while using it and the tongue which projects to show the current sinks down inside when out of use; placing on the cap then makes the meter watertight as well as damage-proof. It sells for $1.—Benford Mfg. Co., Mt. Vernon, N. Y.

Tire Chain Attaching Tool

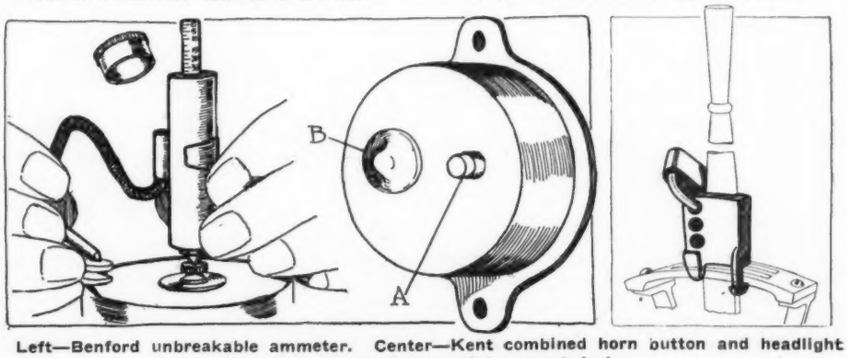
Under some conditions it is not too pleasant a task to fit the essential tire chain, but those who have not the knack of doing this quickly and easily should find the "Alcemo" tool of assistance to them. The sketch shows how it holds one end of the chain while the wheel is revolved, and the other end can then be hooked on the free end of the tool. The price is $1 a pair, or the clips can be bought singly for half this sum.—Alcemo Mfg. Co., Newark, N. J.

Tire Chain Protector

This is a short length of chain which is designed to link the tire chain to the hub cap and so prevent the loss of the chain should the latter come off the wheel through any mischance.—Bodenstein Bros., Rochester, N. Y.



Alcemo tool for attaching tire chains



Left—Benford unbreakable ammeter. Center—Kent combined horn button and headlight dimmer. Right—Commercial gearset lock